3.21 SUBSISTENCE

Rural communities in the EIS Analysis Area embrace their subsistence traditions as a link to their rich cultural heritage, and as a foundation for today's economy, society, and culture. Based on the testimony of residents from communities potentially affected by the project during scoping and the input of tribal cooperating agencies, this section provides an extensive account of the context of contemporary subsistence practices, including the nutritional, economic, social, and cultural dimensions of the subsistence way of life, as well some of the cultural beliefs and values associated with these traditions. The regulatory framework is then described, followed by a description of current subsistence practices in several representative communities through the EIS Analysis Area. This is followed by analysis of impacts to subsistence activities by the proposed Donlin Gold Project and alternatives.

SYNOPSIS

This section describes current subsistence practices within the EIS Analysis Area and evaluates potential project impacts on subsistence practices from the proposed action and alternatives. Each alternative is examined by major project component: mine site; transportation facilities; and pipeline.

Summary of Existing Conditions:

During the Scoping meetings for this project, Alaska Native residents in the EIS Analysis Area emphasized their desire to protect their cultural traditions and subsistence way of life. This section describes subsistence values and beliefs, the framework of the regulatory environment, Traditional Ecological Knowledge, the implications of Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), Alaska subsistence literature, and incorporates comments from local residents. The description of subsistence harvest patterns focuses on community profiles from nine subregions. The Kuskokwim River is divided into four subregions: Upper, Central, Lower-Middle, and Lower. Other subregions are the Bering Sea Coast, Mouth of the Yukon River, Lower Yukon River, Middle Yukon River, and Cook Inlet. Each of these subregions shares a common ecology, a common language, and some common harvest patterns (see Figure 3.21-1).

Subsistence patterns are described in terms of the seasonal round of harvests of a wide variety of species, subsistence use areas of community-based groups, and sharing practices. Potential impacts to subsistence analyzed in this section include reductions in subsistence harvest levels due to changes in availability of subsistence resources, restrictions on access to traditional use areas, increased competition, and socio-cultural changes due to employment and shift work.

Expected Effects:

Alternative 1: No Action – Under this alternative the proposed Donlin Gold Project would not receive permits, and Donlin Gold would not establish a mine site, develop transportation

facilities, or construct a natural gas pipeline. Subsistence resources that had been displaced during the exploration and baseline studies period would likely reoccupy the mine site area, and subsistence users from Crooked Creek may reestablish their use of the area. There would be no increase in competition from non-local residents for subsistence resources.

Alternative 2: Donlin Gold's Proposed Action – The mine site summary impact would be minor, with the exception of a moderately (beneficial) income effect. Crooked Creek residents would see continued low intensity displacement from historic use areas at the mine site, but this displacement would be reduced after closure. Interviews with knowledgeable subsistence users in eight communities emphasized that new employment and income would increase the ability of households to meet the high costs of subsistence equipment and fuel. Most of the impacts would be local (near the mine), except that waterfowl users on the Bering Sea coast may perceive that waterfowl potentially accessing the tailings pond and the pit lake (after mine closure) could be contaminated. Competition for subsistence resources near the mine site would be eliminated during the life of the mine by the implementation of Donlin Gold policies of no hunting and fishing from the mine site. Additionally, historical patterns of competition in the Kuskokwim River drainage over moose and Chinook salmon may increase spatially and in some areas in intensity due to new incomes and therefore increased access to subsistence harvest areas due to purchases of better/more equipment.

The summary impact for transportation facilities would be minor, except moderate for disturbance to subsistence fishing in narrow reaches of the Kuskokwim River. These impacts are generally low in intensity, except for medium intensity effects from barging in narrow, shallow segments, and medium intensity impacts regarding displacement of access to fish camps near Angyaruaq (Jungjuk) Port site.

Summary impact for the pipeline would be minor, except moderate for increased competition near Farewell Airstrip. During construction, intensity of effects on subsistence hunting and fishing is low because there is little overlap between subsistence use areas and the pipeline right-of-way and because the disturbance during construction is limited to short periods. During operations, the intensity of effects from the buried pipeline is low, but less than during construction. However, increased activity at the Farewell Airstrip would constitute a localized moderate intensity increase in competition, affecting the subsistence uses of the communities of McGrath, Nikolai, and Telida.

Other Alternatives: The effects on subsistence resources from implementation of Alternatives 5A and 6A would be similar to the effects of Alternative 2. Differences of note for other action alternatives include:

- *Alternative 3A (LNG-Powered Haul Trucks)* – For transportation facilities, the project barge frequency would be reduced by 32 percent due to reduction in diesel fuel barging. This would reduce impacts to fish and subsistence fishing in narrow reaches of the river to low intensity. The summary effect would be minor.

- *Alternative 3B (Diesel Pipeline)* – For transportation facilities the barge frequency would be reduced by 47.5 percent with elimination of diesel fuel barging. This would partially reduce disturbance and displacement impacts to fish in narrow reaches of the river, so the intensity would be low. The expansion of the dock near Tyonek to receive diesel tankers would represent a 25 percent increase in fuel deliveries and would result in low intensity impacts to marine mammals, including beluga whales. The summary effect would be minor, including reduced impact to subsistence fishing in the affected segments of the Kuskokwim River.

Alternative 4: (Birch Tree Crossing [BTC] Port) – For transportation facilities, the barging distance would be reduced by 39 percent, avoiding the generally more narrow reaches of the river above Birch Tree Crossing and the fishing areas of Aniak, Chuathbaluk, and Napaimute. A longer mine access road (46 miles long; 250 percent longer) would disturb casual, summertime, subsistence uses in the vicinity of Birch Tree Cross port and mine access road. The summary effect would be minor, including reduced barging distance and increased impacts from the longer mine access road.

Alternative 5A (Dry Stack Tailings) and Alternative 6 (Dalzell Gorge Route): – Impacts to subsistence activities would be similar to those of Alternative 2.

3.21.1 THE MANY DIMENSIONS OF SUBSISTENCE

Alaska Native groups in the EIS Analysis Area speak two distinct Alaska Native languages: Yup'ik and Athabascan as detailed in the cultural history discussion in Section 3.20. Historically, the border between the Yup'ik and Athabascan cultures was dynamic and changing. Through the late 18th century, the Central Kuskokwim area was occupied by two distinct groups of Athabascans: the Dena'ina, and Deg Hit'an. In the early 19th century, Yup'ik speaking people from the coast moved into the Central Kuskokwim (Brown et al. 2012). Within the EIS Analysis Area on the upper Kuskokwim River above Swift River are the Dichinanek' Hw'tana (or "timber river people") (Collins 2004), also known as Upper Kuskokwim Athabascans. The Deg Hit'an inhabit the Central Kuskokwim, the lower reaches of the Innoko River, and lower Middle Yukon as far as Anvik. Above the Deg Hit'an on the Yukon River are the Holikachuk people who currently inhabit the community of Grayling (Snow 1981). The Dena'ina also occupy the western side of Cook Inlet, notably in the community of Tyonek.

Historically, the culture and economy of both Yup'ik and Athabascan societies revolved around subsistence or taking food from the land. Starting in the late 19th century these traditions have adapted to rapid change beginning with devastating epidemic diseases, development of a cash economy, and later, beginning in the middle of the 20th century, to population growth followed by competition over subsistence resources. Alaska Natives have faced challenges to maintain access to their traditional lands and subsistence activities. During the land claims movement of the 1960s, Alaska Natives created regional and statewide organizations in an effort to protect their traditional patterns of land use, including the subsistence lifestyle. As a result of their advocacy, legislation to protect subsistence practices was passed by the Alaska Legislature in

1978 and the U.S. Congress in 1980. More detail on the legal and regulatory context is provided below.

Although the protective subsistence legislation represents an important achievement of the land claims movement, it should be pointed out that many Alaska Natives do not like the term subsistence, feeling that it does not adequately describe the importance of wild foods to Alaska Native culture. As the Gwich'in Athabascan elder Jonathan Solomon said:

> *...You cannot break out subsistence or the meaning of subsistence or try to identify it, and you can't break it out of the culture. The culture and the life of my Native people are the subsistence way of life. ... It goes hand in hand with our own culture, our own language, and all our activities* (quoted in Berger 1985).

To describe the holistic nature of subsistence is to say that subsistence is important for nutritional, economic, social, spiritual, and cultural reasons. Nutritionally, locally available wild resources are often superior to imported processed foods. Looking at rural Alaska as a whole, the annual harvest of 295 pounds of wild food per person contains 189 percent of the protein requirements of the rural population and 26 percent of the caloric requirements (ADF&G 2014d).

Wild foods have considerable economic value as part of the modern mixed economy of rural Alaska, and can supplement or partially replace the need for income derived from wage employment. The subsistence economic sector is both cash dependent and highly cash efficient, resulting in large volumes of highly nutritious, culturally valued foods for modest investments of cash. The estimated "replacement value" of the annual harvest of wild foods in rural Alaska is between $147 and $295 million dollars (ADF&G 2014d). Employment opportunities and cash incomes are scarce in rural communities, and generally provide a modest basis to pay bills and to purchase and maintain equipment, such as boats, motors, snowmachines, guns, and subsistence fishing gear, and to pay for the operating costs of subsistence activities including ammunition and gasoline to access subsistence harvest areas. In western Alaska, economic linkages between villages and the wider world include wages earned by commercial fishing, seasonal labor, some full-time employment, and transfer payments from governments and other entities such as ANCSA corporations.

While the harvest and use of wild foods can be measured quantitatively in terms of nutritional and monetary value, many Alaska Native people see wild foods and the subsistence way of life as priceless. A woman from Port Graham put it this way:

> *I don't [know] how anybody...who can place the value on my Nativeness, who can place a value on my thinking, my spirituality, I don't think anybody can. Only myself, and I think each and every one of us need to remember that we are Native and that we need to value that and protect it... through protection of our lands and our lifestyle* (quoted in Berger 1985).

Modern technology, while dependent on cash incomes, has increased people's ability to harvest what they need in less time.

> *They had to fish as long and as much as they could [in the past]. Today without equipment, with the modern equipment we have today, we don't need as much time to get as much fish as we need. So that's, some families will quit fishing within two weeks, some within a month. When I was a boy people would be fishing most of the summer until middle of July, end of July sometimes* (quoted in Ikuta et al. 2013).

Time and money spent on harvesting wild resources can be adjusted depending on need, opportunities for wage labor, and success of recent wage employment, such as commercial fishing. But the investment in money is less important than the hunter's very large investment in time labor or hardship and risk, and it does not alter the fundamental nature of the enterprise. Many rural residents in Alaska do not distinguish conceptually between subsistence and cash elements of the same activity. In villages with a history of commercial fishing, for example, commercial fishing and subsistence fishing occur at the same time and they complement each other, both money and fish are vital to the mixed economy of the village.

While many people are able to integrate subsistence activities and wage labor, economic pressures have forced people to make compromises. During the summer when jobs are available, people have to make choices between working and fishing as reflected in this statement by a resident of Tuntutuliak.

> *Cause most of the jobs are for the summer. Weatherization, boardwalk making, so half the men will be working, probably weekends will be the only option for people who are working. Weekend will be Saturday, weather permitting. So everything is getting tighter. Work. Everything going up. Most men will probably try to be working, fishing season or not. They have no choice. Wintertime – how will they do it? How will they provide for stove oil, lights? If they're thinking about that, then it'll probably be mostly weekends that they'll be fishing, from my understanding* (quoted in Ikuta et al. 2013).

In addition to nutrition and economics, a third dimension of subsistence is social and cultural, encompassing both the social organization and spiritual aspects of Alaska Native life. Harvesting subsistence resources in many cases requires cooperation by several individuals and households, and this cooperation helps knit together cohesive societal units. The shared labor of producing and processing subsistence foods creates and maintains enduring social bonds within kin groups; between men and women, and between elders, adults, and younger people. In this respect, subsistence provides a crucial link between the modern sociocultural systems and their roots (Berger 1985; Nelson 1983).

The traditional society is based on subsistence activities that link generations and the extended family into a rich network of associations, rights, and obligations. The network reflects and re-creates the social order and gives meaning and value to each person's contribution and rewards. The distribution of wild foods to other households throughout a community establishes or further defines the relations of mutual aid and obligation among components of a society, as well as providing increased security in a very challenging natural setting (ADF&G 1990). Leaders are men and women who provide for the needs of others; good hunters share their harvest and are often identified as leaders. In many communities, a small number of families (or households) ultimately harvest the vast majority of subsistence resources (Wolfe 1987). Research shows that 30 percent of households often supply 70 percent of the subsistence foods.

Subsistence foods are also frequently central components of important ceremonies, such as the winter ceremonials practiced by the Yup'ik of southwest Alaska (Fienup-Riordan 1983, 1990a, 1994) and the Northern Athabascan potlatch (Clark 1981; Simeone 1995). The harvest, preparation, and sharing of food is a central feature of these ceremonies, which express and recreate for new generations the central cultural values of respect for the natural world, avoidance of waste, and generosity with the foods that the animals provide.

3.21.2 SUBSISTENCE VALUES AND BELIEFS

In addition to special skills and knowledge needed to live directly from the land, the subsistence way of life also involves cultural values and attitudes: mutual respect, sharing, resourcefulness, and an understanding—that is both conscious and mystical—of the intricate relationships that link humans, animals, and the natural environment. Because Alaska Native groups continue to define themselves to a large degree by the customs and traditions in obtaining, processing, and distributing wild resources, they see the maintenance of these cultural traditions and values as an essential element of their subsistence activities (de Laguna 1969-70; Nelson 1983; Fienup-Riordan 1994; Simeone and Kari 2002).

One important aspect of these traditions is a system of environmental stewardship or self-regulation embedded in local practices and knowledge, evidenced in worldview, property rights, social authority, and the definition of the sacred. Traditional regulations or rules govern all subsistence activities, and are set in place to insure the annual return of the animals and fish. Traditionally based rules govern both the moral and practical behavior of the harvest.

These rules are not arbitrary or illogical but derived from a religious or cosmological tradition passed down orally and based on the belief that all animals are sentient, social beings who freely give themselves to humans, but only if humans treat them with respect (de Laguna 1969-70; Nelson 1983; Fienup-Riordan 1994; Simeone and Kari 2002). The principal of respect governs all relations among beings in the cosmos, and is maintained through proper cultivation, interaction, and stewardship. A man from Oscarville put it this way,

> *If you catch them [birds], you got to eat them, bring them home. You don't just throw them around anywhere. You treat them like they are actual people* (quoted in Brown et al. 2013).

The rules governing the relationship between humans and animals are based on a mythic charter or set of oral traditions that provided the fundamental guidelines or instructions for how humans are to engage with animals and their environment (Langdon 2003; Simeone and Kari 2002). This belief is the basis for the Alaska Native system of stewardship or self-regulation.

The term "engagement" is fundamental to understanding the Alaska Native conception of their relationship with the environment and the animals that human beings depend on to live. Alaska Native people demonstrate respect for the animals and the environment through a variety of actions that encompass every aspect of the harvest, from talking and thinking about animals, to handling animals, to construction of fish weirs, fish racks and other equipment, to sharing the harvest, and welcoming the retuning animals with song and ceremony. By following these rules Alaska Native people believe they ensure an abundance of animals, fish, and plants. This relationship has been called collaborative reciprocity (Fienup-Riordan 1994), or relational sustainability (Langdon 2003). It is through good relations that human beings and the animals and plants they depend on for survival are sustained over time.

Relational sustainability is based on the principle of maintaining a respectful relationship between humans, animals, and the land. To show respect, humans must first be aware of themselves and the world around them. Children are told to be observant of all things, but especially when it comes to fishing.

> *...the elders used to tell them not to ignore anything, to be observant, and one thing was when one was traveling by canoe or kayak, they'd see fish behaving unusually, they were told to observe that fish because, you know, some of the behavior that the fish display can tell you how it's going to be in the wintertime or when it gets to a certain time of the year, something is going to happen, or it could be a sign of a storm or something good* (quoted in Ikuta et al. 2013).

To be aware is to be cognizant of your actions. The intimate connection between humans and animals is reflected in the idea that it is not only important how human beings act but also how we think about animals. The spoken word can have a powerful effect. For example, it is important not to complain or argue about fish or to brag about fishing success because these actions prevent the return of fish.

> *And there's a saying that when people are saying bad things or talking mostly about them in a bad way or saying it's for them only, not for outsiders, the numbers [of fish] go down. And when they say it with everybody there, the abundance or quota will go down, surprising* (quoted in Ray et al. 2010).

> *Right after they started complaining about the fish, I noticed a decline in their number. That's what our elders tell us, not to complain, like they're doing, not to be stingy with other people, but to share that area with everyone, that's how we are... when they do that [be stingy]... the fish knows about their intentions and they don't want to thrive in their area anymore* (quoted in Ray et al. 2010).

Children are taught to show respect in order to be successful hunters and providers.

> *That's why...our elders used to respect the ground. They just don't want to mess it [up]. Even with the hunters, [they] have got to be trained by the elders to respect everything, even the ground where the plants... You just want an environment the way this [is], you just wanna not disturb the ground, you know. The plants and the river for the fish. That's how I grew up. That's how I was taught by one of the elders, too* (quoted in Ray et al. 2010).

Another elder put it this way:

> *...if you don't take care of the fish or animals you'll be, ah – not a nukalpiaq, not a good hunter. Every time you'll go out bird hunting you'll catch one bird while others are catching more – because you don't take care of 'em, it's that way...He provides. If we take care, He'll provide more. Don't be stingy, share...* (quoted in Ikuta et al. 2013).

To show respect for the animals, plants and fish, human beings must follow certain rules including: regulating their harvest or taking only what they need; timing the harvest, skillfully preparing the harvest, avoiding waste, and sharing the harvest.

Regulating the harvest: Yup'ik elders in Eek said that self-limiting the harvest was a fundamental aspect of traditional management. For example, people limit their blackfish harvests and trap only what they need. As one elder explained, when they're trapping for blackfish, sometimes when you catch too many, they just pull them [the traps] out a while" (quoted in Ray et al. 2010).

An Athabascan resident of Nikolai explained that when harvesting salmon in the past they put in a fish trap, but never harvested all of the fish in the run.

> *We just doing it for our own use, subsistence, what we use. And that's what we get. When it's enough, enough. Even still more fish, but sometimes we quit early. Soon as our smokehouse even started getting full, we just pulled the fence out, the fishtrap. Threw it in the bank. And all the fish go by* (quoted in Ikuta et al. 2013).

Yup'ik also explained that they might voluntarily limit their harvests for one year following a loss in the family, as this is a period of spiritual vulnerability and risk of environmental mishap.

> *When a person do that [seal hunting or fishing in the year following a family loss] there's always big waves. And some big chunk of ice moves. That's what happened to us. One of our relatives went down. Wife had a miscarriage. Almost lost our snow machine. Even we lose our sleds. It's not safe* (quoted in Ray et al. 2010).

Timing the harvest: Harvest timing is an important element in self-management because successful subsistence economies rely on efficient seasonal harvest practices. Hunters and fishers report timing their harvest activities to periods when animals and fish are abundant and in their prime. For example, communities along the Kuskokwim River reported harvesting whitefish in the fall when they are fat and accessible in relatively greater numbers. Burbot and ciscoes are also harvested during the fall because they taste better when it is cold. "In the spring time we just leave them alone. We don't care to fish for them because we know the meat is not right" (quoted in Ray et al. 2010).

The weather can have an enormous effect on the salmon preservation process, and several people [from Tuntutuliak] explained that this is one reason why there was so much controversy over the regulated fishing windows of the 2000s. Good fishing weather is breezy, but not too windy, and clear – because the fish will dry much faster on sunny days. Fish preserved in poor weather are definitely of lower quality. Without an enclosed smokehouse and a constant low fire, fish that are hung in rainy weather do not dry well and can be ruined (Ikuta et al. 2013).

> *When weather's bad people even stay out to protect their fish from spoiling – they watch 'em. They didn't have plywood or something on top of the racks, the fish racks them days. They covered the fish with anything they can use to protect them to keep good fish* (quoted in Ikuta et al. 2013).

Drying fish in rainy weather produces an inferior product, and the investment of effort is much riskier. "When the weather is no good, we don't go out fishing. We don't want to spoil the fish from the rain." Too much heat spoils the fish too, "when it gets really hot and there's lots of flies we have to watch, watch the fish that we have and make sure they won't try to spoil them, you know those little maggots. Make sure they don't – we have to take them off" (quoted in Ikuta et al. 2013).

Preparation of the harvest: Rules for preparing the harvest apply to all animals. Recent research in the EIS Analysis Area has focused on salmon and other fish, so this description emphasizes the treatment of fish. Preparing salmon is an important job that can affect both the future abundance of the fish and the success of the fishers. When Yup'ik elders in Tuntutuliak were asked how they made sure the salmon would come back, they reported techniques for proper preparation and preservation of the fish – emphasizing respectful treatment rather than fishing strategies that encourage conservation (Ikuta et al. 2013).

Knowledge of how to care for the fish is passed from generation to generation. It is important to teach younger people how to prepare fish so that they do not spoil. Elders stressed "the

importance of caring for the fish so they don't spoil, so that they stay abundant" (quoted in Ikuta et al. 2013).

At a recent meeting in Aniak an elder from Crooked Creek stressed the importance of teaching young people subsistence skills so they could feed themselves, even if they had jobs.

> *Subsistence way of life is so important to our family, that even my grandkids that were raised in the cities, they come home in the summer to help us with our fishing and the fall time for our hunting. They have learned our ways because they need to know how to feed themselves should it ever come to that* (URS 2013c).

There is concern among some elders that people are no longer following the rules and that this may be one reason why fish are no longer as abundant as they once were.

> *People are not watching their fish and their tools as good as they used to, as well as they used to, like sometimes they would find a piece of fish that had been chewed on or carried away by dogs. Those types of things are happening today sometimes... Some people are getting careless about the ways they take care of their fish, their supplies, and their tools. At some point fish became less abundant* (quoted in Ikuta et al. 2013).

Avoiding waste: A fundamental principal of responsible preparation is not to waste fish. Once caught, fish must be worked on promptly. To ensure quality "no more fish are taken than can be cut within 24 hours, and usually no more than can be processed that day" (Ikuta et al. 2013). A Yup'ik elder in Tuntutuliak explained that,

> *They never used to throw any guts out except for that part there. They keep the fish roe, hang it up, dry it up, and the liver they used for stinkheads. And that thing, the stomach part, the throat part, they used to braid it and then hang it up for dry. They used to hang the hearts too, dry 'em up* (quoted in Ikuta et al. 2013).

An Athabascan elder in the upper Kuskokwim community of Nikolai said "*we did not waste fish, we kept what we wanted, and we store it, that is the way*" (quoted in Holen et al. 2006). Another Nikolai elder "*You can get as much as you want to use. If bones aren't burned that is how it gets lonely, the birds or fish or whatever, getting caught less and less, everything*" (quoted in Holen et al. 2006).

Sharing the harvest: Generosity in sharing food is critical for ensuring proper social relations within a community, and for ensuring proper relations between human beings and their environment. Research on sharing in subsistence based communities indicates that large segments of a community are bound together through sharing (Magdanz et al. 2011). Sharing is to be done discreetly and not boastfully. Generosity will be rewarded. Yup'ik elders in Tuntutuliak said that sharing would cause people to be blessed and successful in subsistence activities. There is an understood belief that hoarding fish without sharing with those around you will bring consequences in regards to fishing.

> *The other issue if you're stingy and don't share, you won't be able to get as much, if you don't share you won't be able to be as productive. The more you share, the more you get. Everybody was taught that right from the beginning* (quoted in Ikuta et al. 2013).

There are particular rules regarding the sharing of the harvest. For example, after a young person makes their first harvest it is customary for the animal or fish to be shared with the elders. A man from Crooked Creek explained:

> *When I got my first marten I asked my mom if I could give it to one of the elders. She said that was the tradition, that I give it to one of the elders. If you get something, you give it away* (quoted in Brown et al. 2012).

In many communities, there were special rules and rituals surrounding the harvest of the first salmon. In Nikolai, for example, people gathered together to share the first harvest and dance.

> *...people would cook it up and eat it together, all sharing. I saw one time a sort of Eskimo dance when I was a kid. But they stopped that. But they used to get together quite a bit and they talked about how they lived long ago. How to take care of your food, don't throw anything away, don't waste.... what they do in the wintertime, like Christmas, everybody cook, put lotta things together, then they got together and eat together. And what they do after that, then old people tell'em stories about how they used to live long ago....Most of what that was about how to take care of your food. Don't throw anything away that you wouldn't take care of, don't waste nothing, that's how it used to be... Here I'm still that way, even today* (quoted in Holen et al. 2006).

In summary, the subsistence way of life is a holistic cultural practice, integrating harvest activities with values and beliefs essential to community survival. Traditional values embedded in relational sustainability establish respectful relations between humans, animals, and the land. Subsistence harvests structured through long-established environmental stewardship customs endure in conjunction with the regulatory environment described in the next section.

3.21.3 REGULATORY ENVIRONMENT

Hunting, fishing and gathering were the primary economic activities for all Alaska Natives up until the middle of the 20th century, and remain important in these communities today. At statehood in 1959, the State of Alaska gained authority for managing fish and wildlife from the federal government. State control of fish and wildlife was a leading argument for statehood since many Alaskans viewed federal management as favoring outside interests and being unresponsive to local needs. The Alaska Constitution established that fish and wildlife "are reserved to the people for common use" and that "no exclusive right or special privilege of fishery shall be created or authorized" (Alaska Constitution, Article 8, Sections 3 and 15).

Subsistence had surfaced as a major focus of the Alaska Native land claims movement, which resulted in Congress passing ANCSA in 1971. The act addressed Alaska Native land claims that had clouded title and delayed conveyance of lands under the Statehood Act, and had also delayed construction of TAPS from the North Slope. ANCSA extinguished aboriginal title, including aboriginal hunting and fishing rights in Alaska in exchange for almost $1 billion in cash and 44 million acres of land transferred to Alaska Native Corporations; but Congress expressed the intent that the Secretary of the Interior would work with the State of Alaska to protect modern Alaska Native hunting and fishing. By the mid-1970s, Alaska Natives lobbied Congress for more specific protections of their subsistence activities.

While subsistence legislation was pending in Congress, in 1978 the Alaska Legislature adopted its first subsistence law, building on provisions since statehood, in which Alaska's regulatory system had managed subsistence separately from recreational and commercial harvesting. The 1978 state law defined subsistence as "customary and traditional uses" [AS 16.05.940 (33)] of fish and wildlife, thereby highlighting the continuing role of subsistence fishing and hunting in sustaining long-established ways of life in the state. Under this law, subsistence was established as the priority consumptive use of fish and wildlife resources (now AS 16.05.258).

In 1980, Congress fulfilled the promise to protect subsistence when it passed ANILCA. Besides creating new national wildlife refuges, parks, and public recreation lands, Title VIII of ANILCA provided a definition of subsistence, a priority for subsistence uses on federal lands, and provisions for participation of subsistence users through regional advisory councils. Under a concept of "cooperative federalism," Title VIII provided that so long as the State of Alaska implemented a compatible program, the state would implement a unified subsistence management program on all lands and there would be no separate federal management of subsistence on federal lands (CFR Title 36, Part 242 [36 CFR 242.1] or CFR Title 50, Part 100 [50 CFR 100.1]).

The state took note of the discrepancy between the various laws and amended state law in 1986 to match ANILCA by limiting subsistence uses to rural residents. However, in 1989, the Alaska Supreme Court ruled in McDowell v. Alaska (785 P.2d 1 [Alaska 1989]) that the rural preference violated Alaska Constitution, including its "common use" provisions regarding use of fish and wildlife. This meant that the State could not give a priority to a person based on where they lived. In essence, the Alaska Supreme Court's decision meant that under Alaska's subsistence law, the subsistence hunting and fishing priority was open to all Alaska residents.

Because Alaska law no longer provided for a "rural" priority in conformance with federal law, the federal government moved to take over management of subsistence on federal public lands in 1989. Several attempts by the State to reconcile the two laws by amending the Alaska Constitution failed when supporters could not muster enough votes in the Alaska Legislature to send a constitutional amendment to Alaska voters for ratification. Federal managers took over authority for subsistence management on federal lands on July 1, 1990, creating divided management of subsistence. This means that different definitions of the subsistence priority apply on state versus federal lands.

Management of subsistence fisheries emerged as a matter of further controversy. In a series of cases consolidated as *Katie John, et al. v United States,* Alaska Native plaintiffs argued that ANILCA's term "public lands" included navigable waters where most subsistence fishing occurred. This complex litigation came to conclusion in 1995, when the 9th Circuit Court of Appeals concluded that federal jurisdiction extended to "reserved" navigable waters only, meaning those on or adjacent to federal lands. The U.S. Supreme Court declined to review this decision and after a moratorium on implementation to allow additional time to the Alaska Legislature to come into compliance with the ANILCA requirements, the federal subsistence program expanded to fisheries in these reserved navigable waters in October 1999. Federal and state law use substantially the same language regarding the definition of subsistence, with minor wording differences in the clause regarding barter, sharing, and trade (16 U.S.C. §3113). The main difference between federal and state regulatory definitions is that federal law gives a preference to *rural* Alaskans, whereas state law allows no such preference.

3.21.3.1 STATE REGULATIONS

Under state law subsistence uses "means the non-commercial, customary and traditional uses of wild, renewable resources by a resident domiciled in a rural [sic] area of the state for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for making and selling of handicraft articles out of non-edible by-products of the fish and wildlife resources taken for personal or family consumption, and for customary trade, barter, or sharing

for personal, or family consumption" (AS 16.05.940[33]). All residents of the state are defined as "subsistence users" (AS 16 and 5AAC 99).

State law protects customary and traditional uses of fish and game resources and the state must provide for those uses before providing for recreational or commercial uses. To decide if a fish stock or game population is associated with customary and traditional uses, state regulation 5 AAC 99.010 directs the Board of Game and the Board of Fish to examine eight factors.[1] Under current Alaska subsistence regulations, if a resource is sufficient to support all uses, then Alaska resident and non-resident hunters may participate. If the resource abundance is sufficient to support only Alaska resident subsistence hunting, all Alaska residents must have an opportunity to take that resource, and non-Alaskan uses are restricted. This is referred to as the Tier I process. If the resource abundance is not sufficient to accommodate all Alaska residents, then under state management, all residents may apply for one of the restricted permits under the conditions of scarcity in the Tier II process.

Two boards make regulations for all hunting and fishing, including subsistence: the Board of Game (BOG) and the Board of Fish (BOF). Each board consists of seven members serving 3-year terms; the governor appoints board members, and the State Legislature approves the appointments. Proposals to change subsistence regulations may come from members of the public, the Department of Fish and Game, or the Boards themselves. About 80 Local Fish and Game Advisory Committees statewide advise the Boards. The Division of Subsistence, which was created under the 1978 subsistence law, has the responsibility of providing the boards with information and harvest data about subsistence activities.

Fish and game management in Alaska is organized by geographic areas. There are 26 Game Management Units (GMUs) in the state with numerous subunits, and special management areas, controlled use, and closed areas. Fisheries management is organized by regions and areas, districts, and subdistricts within the districts, depending upon whether there is commercial, sport, or subsistence and personal use management. The federal management system has largely adopted the geographically based GMUs and fisheries management areas. Most of the EIS Analysis Area is within GMUs 16, 18, 19, and 21, and the Kuskokwim management area.

3.21.3.2 FEDERAL REGULATIONS

The federal subsistence law is found in Title VIII of ANILCA and the implementing regulations are at 36 CFR 242.1 and 50 CFR 100.1. Under the federal law, subsistence uses are

> *the customary and traditional uses by rural Alaska residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade* (ANILCA Section 803).

[1] 5 AAC 99.010 Boards of fisheries and game subsistence procedures (AAC-Alaska Administrative Code).

The federal subsistence management program is organized as a multi-agency program that works cooperatively with rural Alaskans to develop regulations through Regional Advisory Councils and the Federal Subsistence Board. The voting members include the Alaska directors of the FWS, NPS, BLM, BIA, the USDA Forest Service, plus a Chair and two subsistence community representatives appointed by the U.S. Secretary of the Interior and the Secretary of Agriculture.

For federally-managed subsistence uses on federal lands, the eight-member Federal Subsistence Board establishes subsistence regulations. The Board receives recommendations on regulations from 10 Regional Advisory Councils distributed across Alaska. The Federal Subsistence Board is required to give deference to the recommendations of the Regional Advisory Councils and can reject a recommendation only if it is detrimental to the satisfaction of subsistence needs, violates recognized principle of fish and wildlife conservation, or is not supported by substantial evidence. Proposals to change regulations may be made by federal staff, members of the public, Regional Advisory Councils, or by the Board itself.

Subsistence activities involving federally-managed migratory species are governed by other laws, including the Marine Mammals Protection Act (MMPA) and the Migratory Bird Treaty Act (MBTA). The harvest of marine mammals is restricted to Alaska Natives by federal law. Within the EIS Analysis Area, the National Marine Fisheries Service (NMFS) manages the Cook Inlet beluga stocks and the FWS manages walrus in Kuskokwim Bay. In both cases, the agencies cooperate with Alaska Native co-management bodies, such as the Cook Inlet Marine Mammal Council (CIMMC) and the Alaska Native Migratory Bird Co-Management Council.

As detailed above, federal law defines "subsistence" as the customary and traditional uses by rural residents of fish and wildlife and other renewable resources for food, clothing, shelter, and handicrafts.[2] So, as in state law, federal law defines the subsistence use of fish and wildlife resources based on customary and traditional use patterns. The Federal Subsistence Board determines which communities are rural, and then which communities have a pattern of customary and traditional use for particular fish stocks and wildlife populations. Additional provisions and determinations apply to subsistence uses on NPS lands. The Federal Subsistence Board uses eight factors to determine customary and traditional use, very similar to those used by the state.

3.21.4 TRADITIONAL ECOLOGICAL KNOWLEDGE

In the last three decades, Alaska Natives have effectively advocated for recognition of their complex bodies of knowledge and understanding about climate, weather, landscapes, migratory patterns, animal life histories, and seasonal distributions. This traditional ecological knowledge (TEK) is just as important as modern means of transportation and hunting technology in supporting safe and efficient subsistence harvest activities.

Usually associated with indigenous societies, TEK can provide a source of insights from people intimately familiar with their surroundings. These insights can be useful for the assessment of environmental impacts. However, a major challenge to researchers and decision-makers is how

[2] Section 803 Definitions in ANILCA P.L. 96-487 (ANILCA-Alaska National Interest Lands Conservation Act, as amended).

to integrate the two sources of knowledge (TEK and scientific measurement) in a meaningful and productive way (Huntington 1998).

As urged by stakeholder and tribal cooperators, an inclusive approach to TEK is taken here. In recent scholarship, different definitions emphasize different facets. Berkes (1999) defines TEK as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and their environments." For Berkes, traditional knowledge involves both objective knowledge and cultural beliefs. Huntington (1998) defines TEK as "the system of experiential knowledge gained by continual observation and transmitted among members of a community." This definition emphasizes the observational knowledge accumulated as traditional knowledge, and this body of ecological information has the potential to augment the empirical observations of Western science. Considering the various definitions, it is important to recognize that TEK encompasses both the observational knowledge and the values and beliefs that give meaning to these observations within the cultural context of specific indigenous communities passed down through time and many generations.

Pierotti and Wildcat (2000) write that traditional knowledge is inherently multidisciplinary.

> *It not only forms the basis for indigenous concepts of nature but also for concepts of politics and ethics. There are therefore no clearly defined boundaries between philosophy, history, sociology, biology and anthropology in indigenous thought.*

This larger conception is often termed Traditional Ecological Knowledge and Wisdom, or TEKW. Some of the characteristics of this way of thought are that it is:

> *Inherently local and practical, focused on finding food and other resources in specific environments.*
>
> *Based on observations of very specific localities, over a long period of time. Long-time observations of this sort can be very discriminating in detecting changes and may be seen as comparable to "trend indicators" in Western science. This may be misunderstood, or dismissed by some, as merely anecdotal.*
>
> *Unlike Western science, which develops discrete analytic categories of study, traditional knowledge is holistic and cumulative. That is, a local person's view of their environment is frequently shaped by a wide variety of factors, including observed changes in resources, but also the circumstances of competition over resources, regulation, and history.*
>
> *Traditional knowledge is set within a value and belief system about proper relations between human and the natural world. In the indigenous cultural paradigm animals are considered nonhuman persons possessing awareness and meriting respect* (Fienup-Riordan 1994).

The study of TEK has been vigorously advocated by Alaska Natives, who insist that their accumulated knowledge of the lands in which they live, of the plants and animals that they harvest, and of the changing physical environment should be recognized as equally valid to that knowledge gained through western scientific methods.

Resource managers have started to gather and integrate TEK into research programs and co-management plans and partnerships. An early Alaskan example is the development of the Alaska Eskimo Whaling Commission and North Slope Borough support for gathering TEK from Alaskan Native whalers. Their knowledge was needed to counter the estimates of low bowhead

whale numbers that moved the International Whaling Commission (IWC) towards a complete ban on subsistence whaling. Additional data, including the observation of the Alaska Eskimo whaling captains, presented to the IWC in the years following 1978 led to a quota of allowed strikes and harvests. Historical information justified the allocation to meet the cultural and subsistence need. Rigorous bowhead whale census and other biological and behavioral studies were combined with the TEK of whalers showing that more bowheads were present than previously believed. The resulting cooperating management regime, involving NMFS and the Alaska Eskimo Whaling Captains has contributed to bowhead conservation and population recovery, while providing for a sustainable subsistence whaling program, (Braund and Moorehead 2009; NMFS 2013d).

More recent research initiatives on the Kuskokwim River have included TEK studies as an integral part of strategies to develop fuller understandings of complex fisheries ecosystems and to promote direct participation of the largely Alaska Native communities that rely on these resources. In 1999, the Federal Subsistence Board established the Fisheries Resource Monitoring Program in which funding was directed to stock assessment, subsistence harvest assessment, and TEK studies. Starting in 2002, the Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative began a broad-ranging research effort to understand the ecosystem dynamics behind declines in western Alaska salmon populations. This program too, partnered with Alaska Native and tribal organizations to integrate TEK into the research agenda and to create the basis for dialogue between fisheries scientists, managers and local communities (Brelsford 2009).

One example of converging TEK and scientific research, funding under the Fisheries Resource Monitoring Plan, is a whitefish radiotelemetry project conducted by the FWS on the lower Kuskokwim River (Harper et al. 2008). TEK interviews conducted in several lower Kuskokwim River communities appear to confirm that whitefish migrate into the area during the spring, feed in lakes during the summer, and out-migrate in the fall. Whitefish spawn in the fall, after leaving summer feeding areas, which corresponds to locals' observations. Both locals and scientists think that juvenile whitefish rear in tundra lakes of the Kuskokwim river drainage (Ray et al. 2010). Locals also believe that whitefish do travel long distances and overwinter up river, but the scientists could not confirm this since the scientists did not collect data during the winter (Ray et al. 2010). Several tagged whitefish were caught in the Bethel area indicating that whitefish populations could be under pressure from fishers in other more populated areas (Ray et al. 2010). Thus, TEK adds information, perspective, and meaningful participation by the people most affected by resource management and development plans.

Local observations, or TEK, regarding climate change are another important source of information on current and changing subsistence practices. The Alaska Native Tribal Health Consortium (ANTHC 2015) is cataloguing such observations in a statewide Local Environmental Observer (LEO) Network database

3.21.5 COMMUNITY HARVEST PATTERNS

The description of subsistence harvest patterns focuses on community profiles from nine subregions. The Kuskokwim River is divided into four subregions: Upper, Central, Lower-Middle, and Lower. Other subregions are the Bering Sea Coast, Mouth of the Yukon River, Lower Yukon River, Middle Yukon River, and Cook Inlet (see Figure 3.21-1).

These subregions share a common ecology, a common language, and some common harvest patterns. The decision to examine subsistence at the subregional and community level is to

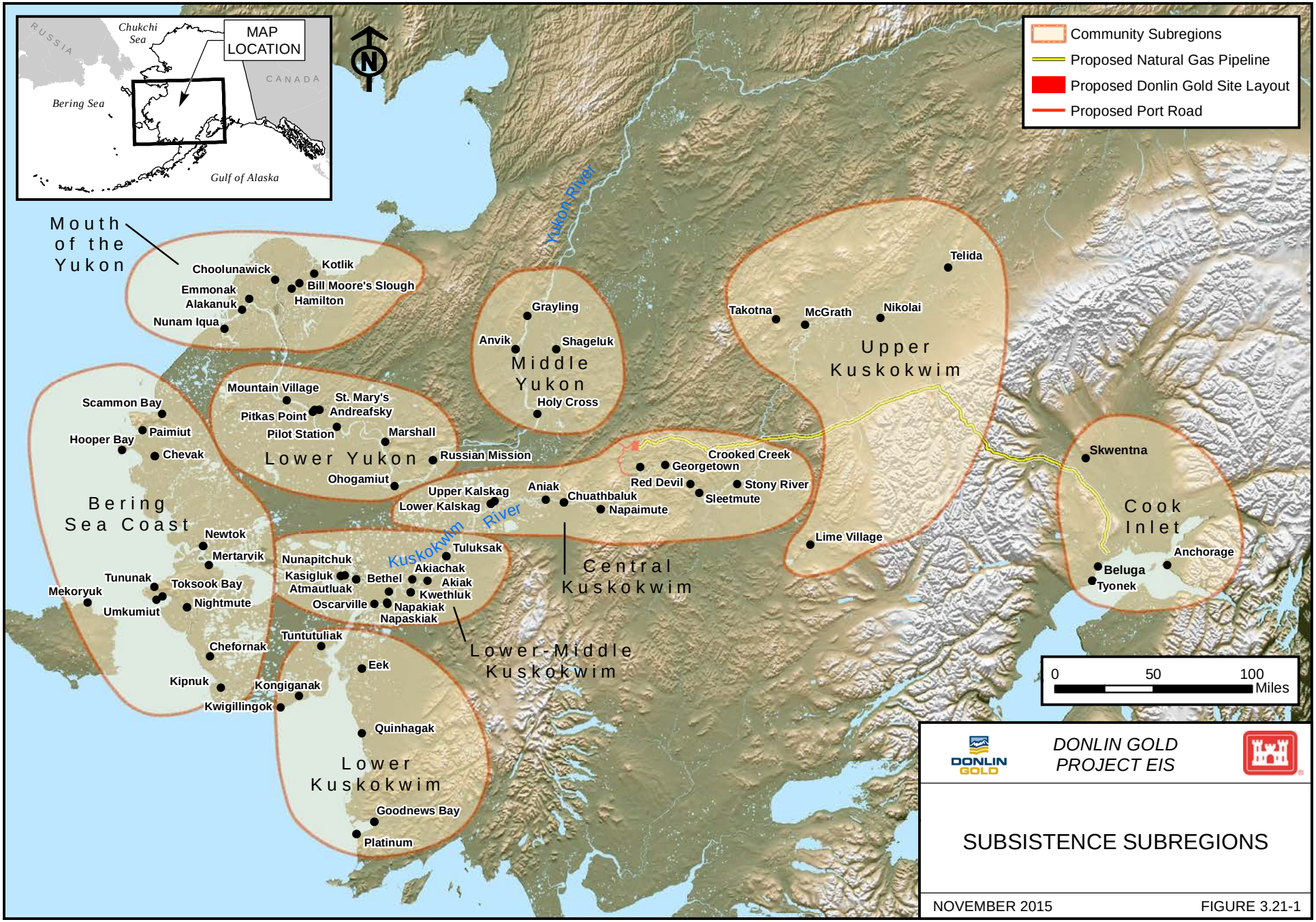
clearly demonstrate subregional patterns highlighting communities that have comprehensive subsistence harvest survey data. Resource use practices fall into the subregional patterns, and impacts from the proposed Project are likely to similarly affect communities within a subregion.

The first criterion for choosing which communities to profile was to select those whose subsistence practices may be directly affected by the mine site, the transportation facilities, and the pipeline. In this section, the subregions are presented in a sequence with the Kuskokwim River basin subregions first, followed by the Bering Sea Coast, the mouth of the Yukon, the middle Yukon, and finally the Cook Inlet subregion. Communities located in the Kuskokwim River basin subregions and the Cook Inlet subregion may experience both environmental and socio-cultural impacts from the project while those communities on the Bering Sea Coast and Yukon River communities, in contrast, may be affected primarily by the socio-cultural impacts of employment at the proposed Donlin Gold Project. For this reason, we have largely summarized the subsistence practices of communities in the Bearing Sea Coast and Yukon subregions.

A second criterion was that detailed harvest data is not equally available for all potentially affected communities. The best and most recent data presented in this section are drawn from studies commissioned by Donlin Gold in 28 communities between 2010 and 2014 and undertaken by Alaska Department of Fish and Game (ADF&G), Division of Subsistence. These studies are:

- 2010 (Study year 2009): Aniak, Chuathbaluk, Crooked Creek, Red Devil, Sleetmute, Stony River, Kalskag, and Upper Kalskag.
- 2011 (Study year 2010): Oscarville, Kwethluk, Akiak, Tuluksak, Georgetown, and Napaimute.
- 2012 (Study year 2011): Napaskiak, Napakiak, McGrath, Takotna, Nikolai, Anvik, Grayling, and Russian Mission.
- 2014 (Study year 2013): Scammon Bay, Quinhagak, Eek, Tuntutuliak, Pilot Station, and Shageluk, Nikolai. Unfortunately, this last study will not be available until 2016, so data from this study is not included in the EIS.

Where needed, additional data have been used from older ethnographies and from reports compiled by the Division of Subsistence and other divisions at ADF&G on specific species. This is the best available data on subsistence at the community level, and provides reliable documentation on an array of important subsistence resources, levels of participation in subsistence activities, harvest levels, traditional use areas, as well as data on the sharing of these resources. However, the types of data collected varied according to the study. For example, all of the studies commissioned by Donlin Gold did not include a seasonal round of subsistence activities but, with the exception of Stony River, did include detailed information on wild food harvesting and processing networks.


MAP LOCATION
RUSSIA
Chukchi Sea
CANADA
Bering Sea
Gulf of Alaska
N
Community Subregions
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
Yukon River
Mouth of the Yukon
Choolunawick
Kotlik
Bill Moore's Slough
Hamilton
Emmonak
Alakanuk
Nunam Iqua
Grayling
Anvik
Shageluk
Middle Yukon
Holy Cross
Telida
Takotna
McGrath
Nikolai
Upper Kuskokwim
Mountain Village
St. Mary's
Andreafsky
Pitkas Point
Pilot Station
Marshall
Russian Mission
Lower Yukon
Scammon Bay
Paimiut
Hooper Bay
Chevak
Ohogamiut
Crooked Creek
Georgetown
Red Devil
Stony River
Sleetmute
Skwentna
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napaimute
Kuskokwim River
Bering Sea Coast
Newtok
Mertarvik
Tuluksak
Nunapitchuk
Akiachak
Kasigluk
Bethel
Akiak
Atmautluak
Kwethluk
Oscarville
Napakiak
Napaskiak
Central Kuskokwim
Lime Village
Cook Inlet
Anchorage
Beluga
Tyonek
Tununak
Toksook Bay
Mekoryuk
Nightmute
Umkumiut
Tuntutuliak
Chefornak
Eek
Kipnuk
Kongiganak
Kwigillingok
Lower-Middle Kuskokwim
Quinhagak
Lower Kuskokwim
Goodnews Bay
Platinum
0
50
100
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
SUBSISTENCE SUBREGIONS
NOVEMBER 2015
FIGURE 3.21-1

3.21.5.1 SUBSISTENCE HARVEST PATTERNS: UPPER KUSKOKWIM SUBREGION

The upper Kuskokwim subregion includes the predominantly Athabascan communities of Telida, Takotna, Medfra, McGrath, and Nikolai. Lime Village is included in the upper Kuskokwim subregion although the community is not located on the mainstem of the Kuskokwim and residents speak the Dena'ina language. Nikolai was chosen as the representative community for this subregion.

The current population of the subregion is 509.[3] Neither Telida nor Medfra have resident populations or future resettlement and development plans. The current harvest patterns of the four contemporary communities reflect their historical dependence on a diverse resource base with heavy reliance on moose and salmon supplemented by harvests of small game, non-salmon fish species, migratory birds and eggs, and a wide variety of edible plants. Data from household surveys conducted at Lime Village in 2007 (Holen and Lemons 2010) and in McGrath, Nikolai, and Takotna in 2012 (Ikuta et al. 2014) show that all four communities harvested an estimated total of 176,044 edible pounds of subsistence resources. No community harvest data are available for Telida or Medfra. For the three upper Kuskokwim communities moose was the primary species harvested, followed by Chinook salmon. In Lime Village, the bulk of the subsistence harvest was composed of sockeye salmon, caribou, and then moose. Per capita harvests for the four villages in this subregion varied from 935.5 pounds in Lime Village to 161 pounds in Takotna (Table 3.21-1).

Table 3.21-1: Upper Kuskokwim Subregion Per Capita Harvests (pounds)

Community	Nikolai**	McGrath	Takotna	Lime Village
Reference Year	**2011**	**2011**	**2011**	**2007**
Population of community	117	356	52	27
Number of households	39	142	22	11
All Resources in pounds	499.35	236.45	161.00	935.5
Marine Mammal	0.00	0.00	0.00	0.00
Seal	0.00	0.00	0.00	0.00
Sea Otter	0.00	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00	0.00
Walrus	0.00	0.00	0.00	0.00
Whale	0.00	0.00	0.00	0.00
Large Land Mammal	247.2	115.0	131.2	259.97
Bison	0.00	0.00	0.00	0.00
Black Bear	10.4	6.63	7.03	20.47
Brown Bear	1.48	0.21	0.00	0.00

[3] Data on all subregional community populations come from DCCED 2014c.

Table 3.21-1: Upper Kuskokwim Subregion Per Capita Harvests (pounds)

Community	Nikolai**	McGrath	Takotna	Lime Village
Reference Year	**2011**	**2011**	**2011**	**2007**
Caribou	2.00	1.11	0.00	158.82
Dall Sheep	0.00	0.00	0.00	0.00
Goat	0.00	0.00	0.00	0.00
Moose	233.30	107.01	124.16	63.53
Small Land Mammal	14.60	11.26	5.45	17.15
Beaver	12.00	10.11	5.45	13.38
Coyote	0.00	0.00	0.00	0.00
Fox	0.00	0.00	0.00	0.00
Hare	0.46	0.64	0.00	0.00
Land Otter	0.04	0.01	0.00	0.00
Lynx	0.00	0.00	0.00	0.00
Marmot	0.00	0.00	0.00	0.00
Marten	0.00	0.00	0.00	0.00
Mink	0.00	0.06	0.00	0.00
Muskrat	0.00	0.05	0.00	0.00
Porcupine	1.90	0.12	3.76	3.76
Squirrel	0.18	0.28	0.00	0.00
Weasel	0.00	0.00	0.00	0.00
Wolf	0.00	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00	0.00
Fish	207.0	91.62	9.86	605.67
Salmon	131.00	66.00	1.37	555.80
Non-Salmon	75.90	25.62	8.48	49.88
Marine Invertebrate	0.01	0.18	0	0.00
Birds and eggs	24.4	9.08	10.77	0.00
Crane	0.13	0.37	0	0.00
Duck	8.18	1.41	0.38	12.08
Geese	10.11	2.12	0.51	5.41
Seabird and loon	0.00	0.00	0.00	0.00
Shorebird	0.00	0.00	0.00	0.00
Swan	0.43	0.08	0.00	0.71
Upland Game Birds	5.59	5.10	0.00	3.42

Table 3.21-1: Upper Kuskokwim Subregion Per Capita Harvests (pounds)

Community	Nikolai**	McGrath	Takotna	Lime Village
Reference Year	**2011**	**2011**	**2011**	**2007**
Birds Eggs	0.00	0.00	0.00	0.00
Vegetation	9.8	14.2	4.3	48.2

Notes:
**Representative community

Source: Holen and Lemons 2010; Ikuta et al. 2014.

Subsistence harvests in upper Kuskokwim communities involve a high reliance on large land mammals and fish. These resources are harvested at different times of the year (shown in Figure 3.21-2) illustrating the seasonal round of Nikolai as an example for the Upper Kuskokwim sub-region.

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Black Bear				--				--	--	--	--	--				--								
Grizzly Bear					--		--									--								
Moose								--	--	--	--					--								
Caribou	--	--											--	--	--	--	--	--						
Sheep	--	--												--	--							--	--	--
Wolf											--	--	--	--	--	--	--	--	--					
Marten																								
Mink																								
Otter																								
Fox																								
Lynx																								
Beaver								--	--	--	--	--	--	--	--					--	--			
Muskrat			--					--																
Hare							--						--					--						
Porcupine					--																			
Waterfowl			--				--	--			--	--	--											
Grouse							--				--						--	--	--	--	--	--		
Berries								--	--	--						--								
Plants							--	--	--			--	--											
Firewood																								
King salmon							--				--	--												
Chum salmon									--					--	---	--	--	--						
Coho salmon											--	--	--											

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Whitefish								--	--	--	--	--	--				--							
Sheefish					--	--				--				--	--	--	--	--						
Pike							---	--	--	--	--	--	--			--	--	--						
Blackfish	--	--																					--	--
Grayling								--	--	--	--	--	--	--										

Source: Ikuta et al. 2014

Figure 3.21-2: Nikolai Seasonal Round of Subsistence Harvests

3.21.5.1.1 NIKOLAI

Nikolai is an Athabascan community located on the south fork of the Kuskokwim River, 46 air miles east of McGrath. Because of its geographic isolation and for economic and cultural reasons subsistence remains important to the community. In 2011, the estimated population was 117 people. In January of 2012, researchers from the ADF&G surveyed 26 of 39 households in Nikolai. Questions on the survey pertained to harvests obtained in 2011. Expanding for the 13 unsurveyed households, Nikolai's estimated total harvest in 2011 was approximately 58,416 pounds with an average household harvest of 1,498 pounds. The average per household income in 2011 was $28,638 (Ikuta et al. 2014).

Species harvested and used: Nikolai households used an average of 19 different subsistence resources in 2011 and every household reported using and harvesting a subsistence resource (Ikuta et al. 2014). Large land mammals and vegetation were the two most widely used resources (100 percent of households), followed by fish (85 percent), and upland game birds (81 percent). All households in the survey reported using moose, while 73 percent reported using Chinook salmon, 80 percent reported using berries and 73 percent reported using a fresh water fish species. Some 65 percent of households surveyed said they harvested a large land mammal and 58 percent said they harvested a moose (Table 3.21-2). All households reported harvesting vegetation and 65 percent reported harvesting fish.

Table 3.21-2: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Nikolai, 2011

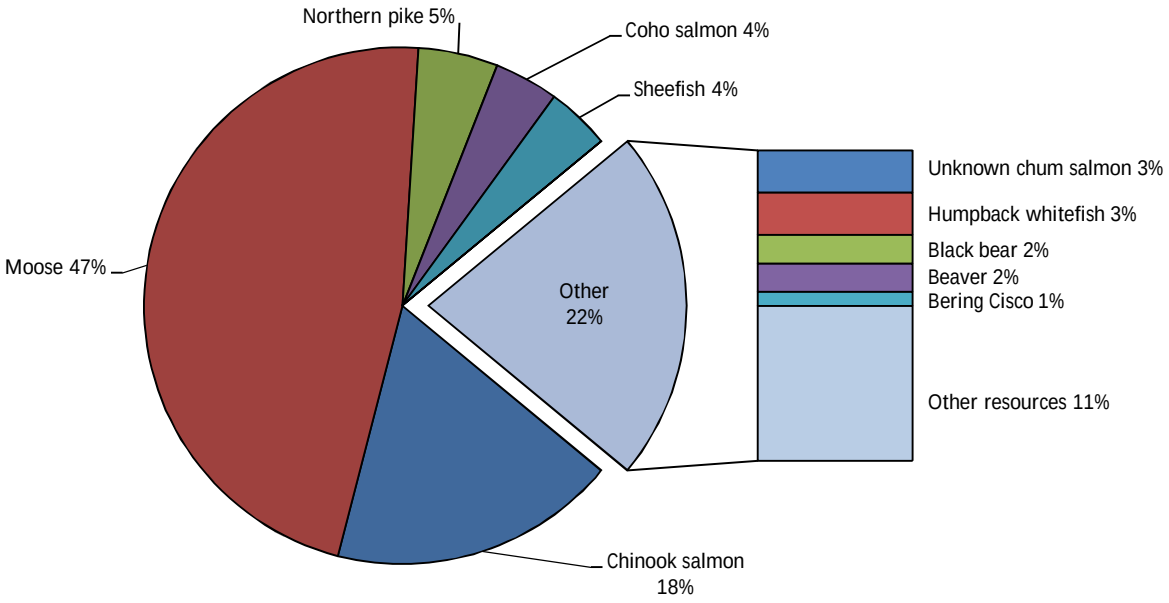
	Percentage of Households, N 39*			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	73%	42%	35%	58%
Chum	46%	12%	8%	42%
Coho	50%	23%	15%	35%
Sockeye	19%	15%	8%	12%
Pink	8%	4%	0%	4%
Unknown salmon	4%	0%	4%	4%
Non-Salmon				
Whitefish	54%	35%	23%	38%
Sheefish	50%	35%	19%	23%
Smelt	8%	0%	0%	8%
Land & Marine Mammals				
Black Bear	50%	27%	19%	38%
Caribou	15%	4%	8%	15%
Moose	100%	58%	58%	65%
Beaver	54%	42%	23%	35%
Hare	19%	19%	0%	0%
Muskrat	0%	0%	0%	0%
Seals	4%	0%	0%	4%

Table 3.21-2: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Nikolai, 2011

	Percentage of Households, N 39*			
	Using	**Harvesting**	**Giving away**	**Receiving**
Birds				
Ducks	54%	42%	23%	23%
Geese	65%	46%	27%	27%
Upland Birds	81%	81%	35%	23%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	80%	77%	46%	58%
Wood	88%	77%	35%	42%

Notes:
*N = number of households in the community
Source: Ikuta et al. 2014

By usable pounds, moose made up the largest part of the total community harvest (47 percent), followed by several species of fish including Chinook salmon, Northern pike, coho salmon, and sheefish (Figure 3.21-3). Other resources harvested included humpback whitefish, black bear, beaver, and Bering cisco. According to Stokes and Andrews (1982), Nikolai residents considered moose to be the most important source of food because caribou are not available, and salmon simply cannot substitute for moose as a food source. Moose are important and people expend considerable time and money in the harvest.



Source: Ikuta et al. 2014. Figure 6-1. Top 10 Species Harvests ranked by estimated edible weight, Nikolai, 2011.

Figure 3.21-3: Composition of Nikolai Subsistence Harvests, 2011

Harvest areas: In 2011, Nikolai residents reported using an area of 757 square miles for subsistence. Residents reported that harvest areas for most subsistence resources overlapped and their traditional territory and includes a very large area encompassing most of the major tributaries of the Upper Kuskokwim drainage (Figure 3.21-4).

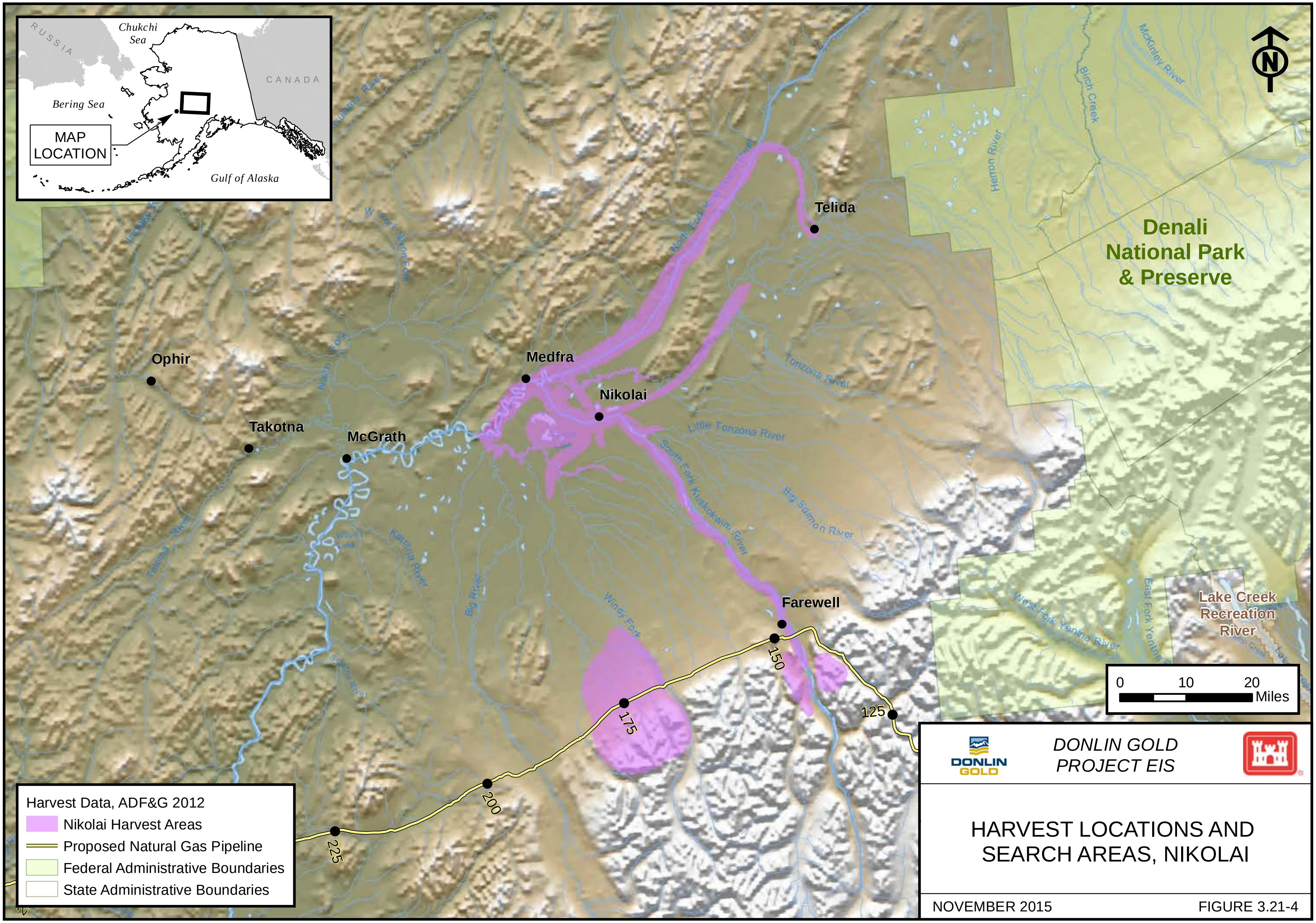
In 2011, households reported searching for moose primarily around the village, along the South Fork of the Kuskokwim River downstream from Nikolai, the Salmon River, and the North Fork of the Kuskokwim almost to Telida. Caribou, moose, as well as black and brown bear were also hunted along the South Fork of the Kuskokwim River and the upper reaches of Windy Fork of the Kuskokwim into the foothills of the Alaska Range (Ikuta et al. 2014).

Most Nikolai residents fished for Chinook salmon along the Salmon River, Pitka's Fork near Medfra, the North Fork of the Kuskokwim, and Blackwater Creek. Whitefish harvest locations are almost limitless in the area around Nikolai and residents spoke of harvesting whitefish in numerous locations almost year around. Pike are another important resource that was widely available throughout the area (Ikuta et al. 2014).

Sharing: Harvesting households share wild foods widely, through kinship and friendship relationships, between households within Nikolai and with households in other communities in Alaska (Figure 3.21-5). Each node represents one household (or household in another community in the case of the blue circle), the size of which correlates to the household's total harvest amount. The nodes are shaped according to the structure of the household, and colored according to age of the heads of household. The directional arrows portray sharing of resources and originate from the source household providing the resource directed toward the receiving household. The weight of the line represents the number of links between households.

In many Alaska Native communities, approximately 30 percent of households produce 70 percent of the subsistence harvest. A part of this harvest is shared with other members of the community. High harvesting households can take several configurations. Most are headed by a mature married couple with grown children, but some are headed by a single male or, in the case of Nikolai, headed by a single female. Another characteristic of these households is that they frequently have high incomes and access to the necessary equipment such as boats, motors and firearms. Where data is available we have included information about income levels or employment for individual high harvesting households.

In Nikolai, the composition of high harvesting households, depicted by the larger triangles and squares in Figure 3.21-5, varied and included households headed by single males and single females as well as married couples, suggesting that harvesting and sharing patterns are transferred between generations (Ikuta et al. 2014). The extent of sharing within the community is indicated by the fact that 92 percent of households said that they had received a resource from others, and 85 percent said they had given away a resource. Moose, berries, and Chinook salmon were the most commonly shared resources (Table 3.21-2). Residents also reported sharing food with five other communities, particularly McGrath (Ikuta et al. 2014).



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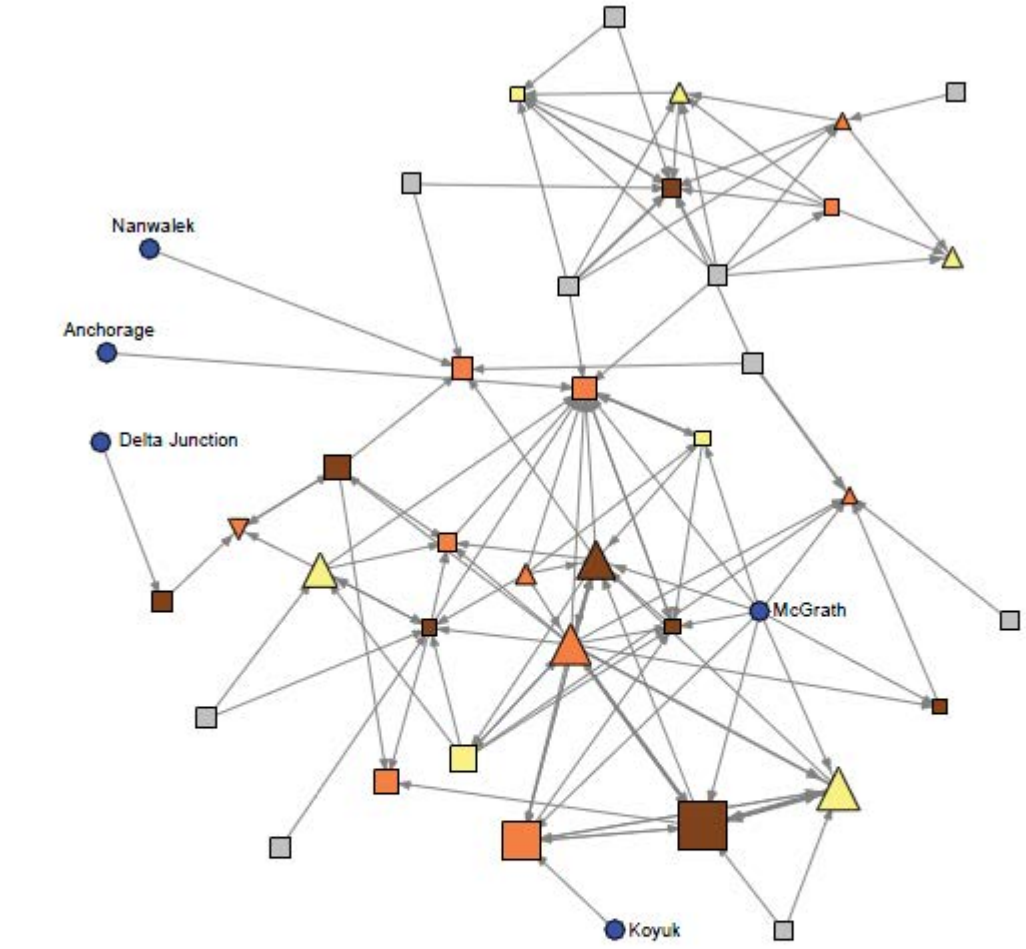
HARVEST LOCATIONS AND SEARCH AREAS, NIKOLAI

NOVEMBER 2015

FIGURE 3.21-4



LEGEND

	Age of household head (years)			
	< 40	40 to 59	> 59	Unknown
Couple head	△	△	△	△
Single female head	▽	▽	▽	▽
Single male head	△	△	△	△

SYMBOLS are scaled by households' total subsistence harvests (in edible pounds). Surveyed households with many sources of goods and services appear near the center of the figure. Households with fewer sources appear around the edges.

Flows of wild foods from source harvesting and processing households to consuming households, as reported by consuming (surveyed) households

Household not surveyed

Household in another community

LINES are scaled by the number of resources harvested and processed by other households for surveyed households. Arrows point from source households to surveyed households. A household's production for itself is not shown.

Data Sources: ADF&G (2012)

DONLIN GOLD

DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK, NIKOLAI

NOVEMBER 2015 FIGURE 3.21-5

Variability: In 2011, Nikolai residents described long-term changes in subsistence over the past century. These changes included reduction in the amount of salmon harvested for dog food, an increase in the reliance on moose corresponding with the increase in moose populations at the start of the 20th century, and regulatory restrictions that affected the harvest patterns of Chinook salmon, caribou, and Dall sheep. More recent changes include observed declines in the size and abundance of Chinook salmon, increases in the price of gasoline that has limited travel for subsistence, and the decline in locally available caribou herds (Ikuta et al. 2014).

3.21.5.2 SUBSISTENCE HARVEST PATTERNS: CENTRAL KUSKOKWIM SUBREGION

The Central Kuskokwim subregion includes the ten communities of Stony River, Sleetmute, Red Devil, Georgetown, Crooked Creek, Napaimute, Chuathbaluk, Aniak, and Upper and Lower Kalskag. In the study year of 2010, Georgetown and Napaimute had no year-round resident population. Georgetown and Napaimute were surveyed in 2011 (study year 2010) while the other eight central Kuskokwim communities were surveyed in 2010 (study year 2009). The current population of the eight residential communities is 1,451. The populations of Red Devil, Sleetmute, and Stony River were small and declining as residents move to find better employment opportunities, while the other five communities experienced slight population increases (Brown et al. 2012).

The contemporary harvest patterns are documented for eight of the these communities and largely reflect historical patterns typified by a diverse resource base with heavy reliance on salmon and moose supplemented by harvests of small game, non-salmon fish species, migratory birds and eggs, and a wide variety of edible plants. In 2009, residents of the eight documented communities harvested an estimated total of 411,135 edible pounds of subsistence resources, or 291 pounds per person. Chinook, chum, coho, and sockeye salmon provided 65 percent of the total regional subsistence harvest while moose contributed 11 percent (despite the closure of the local GMU 19A to moose hunting). By itself, Chinook salmon provided 30 percent of the regional harvest (Brown et al. 2012). Per capita harvests for these Central Kuskokwim communities varied from 187 pounds in Lower Kalskag to 533 pounds in Stony River (Table 3.21-3). The communities of Stony River, Sleetmute, Crooked Creek, Chuathbaluk, and Aniak, were selected as example communities for this sub-region.

Table 3.21-3: Central Kuskokwim Subregion Per Capita Harvests

Community	Stony River**	Sleetmute**	Red Devil	Crooked Creek**	Chuathbaluk**	Aniak**	Upper Kalskag	Lower Kalskag
Reference Year	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**
Population of community	63	90	32	139	122	502	203	299
Number of households	20	37	13	40	36	170	60	75
All Resources pounds per capita	532.51	405.23	305.30	245.41	244	306.3	345.08	186.72
Marine Mammal	0.00	0.00	0.00	0.00	0.00	2.10	0.00	0.00
Seal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sea Otter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Walrus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Whale	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00
Large Land Mammal	20.26	43.90	21.26	25.47	40.89	41.18	46.36	35.35
Bison	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Black Bear	2.63	5.96	16.93	8.42	3.92	2.42	5.56	0.40
Brown Bear	0.00	0.00	0.00	0.00	1.38	0.00	0.00	1.12
Caribou	3.42	3.33	4.97	0.00	3.82	0.94	0.80	1.55
Dall Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Moose	14.21	34.62	0.00	17.05	31.76	37.82	40.00	32.27
Small Land Mammal	38.68	15.08	8.80	6.78	7.96	3.16	7.86	3.29
Beaver	38.68	13.30	7.78	6.32	7.20	2.80	3.97	2.73
Coyote	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fox	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3.21-3: Central Kuskokwim Subregion Per Capita Harvests

Community	Stony River**	Sleetmute**	Red Devil	Crooked Creek**	Chuathbaluk**	Aniak**	Upper Kalskag	Lower Kalskag
Reference Year	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**
Hare	0.00	1.46	0.41	0.32	0.17	0.19	1.95	0.31
Land Otter	0.00	0.15	0.11	0.00	0.29	0.01	0.93	0.05
Lynx	0.00	0.10	0.00	0.00	0.03	0.08	0.05	0.00
Marmot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marten	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mink	0.00	0.00	0.07	0.00	0.01	0.02	0.62	0.00
Muskrat	0.00	0.02	0.28	0.02	0.00	0.02	0.02	0.07
Porcupine	0.00	0.02	0.15	0.13	0.23	0.04	0.32	0.13
Squirrel	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Weasel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wolf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fish	458.4	330.1	261.6	200.24	179.0	249.9	247.10	130.8
Salmon	365.99	277.10	141.73	171.06	158.98	190.04	198.80	98.63
Non-Salmon	92.43	53.9	119.83	29.18	20.01	49.58	48.30	0.00
Marine Invertebrates	0.00	0.00	0.00	0.21	0.00	0.00	0.00	32.18
Birds and eggs	5.35	0.00	5.69	0.00	2.53	0.00	0.00	0.00
Crane	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.27
Duck	0.91	1.63	0.59	0.64	0.81	0.59	1.09	1.14
Geese	0.25	1.05	0.28	0.20	0.8	0.43	3.24	1.38
Swan	0.00	0.46	0.00	0.13	0.00	0.03	0.50	0.00

Table 3.21-3: Central Kuskokwim Subregion Per Capita Harvests

Community	Stony River**	Sleetmute**	Red Devil	Crooked Creek**	Chuathbaluk**	Aniak**	Upper Kalskag	Lower Kalskag
Reference Year	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**	**2009**
Upland Game Birds	4.18	2.49	4.82	0.87	0.91	0.94	1.87	0.99
Birds eggs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vegetation	9.79	10.53	7.9	10.86	13.68	5.76	36.24	12.6

Notes:
** Representative community

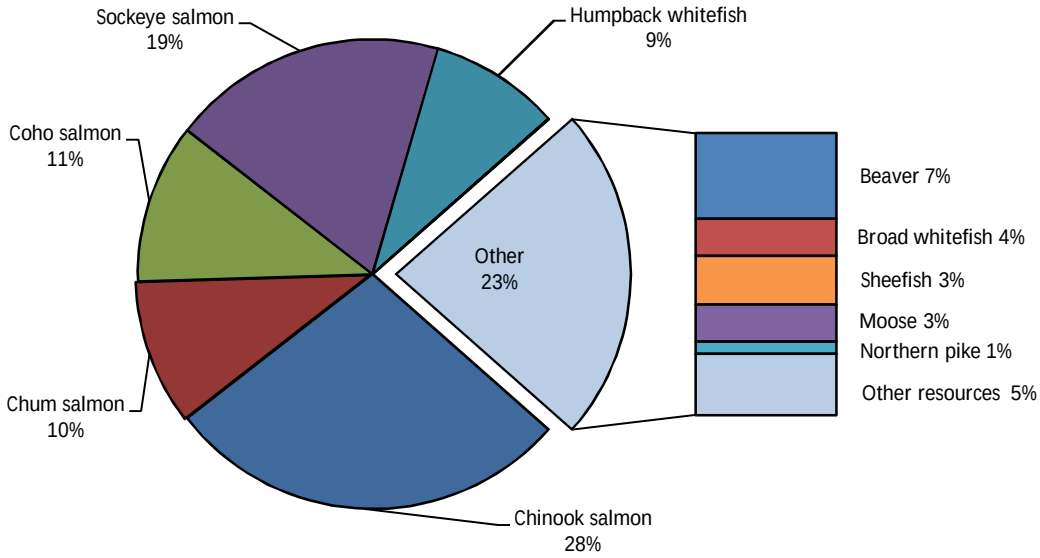
Source: Brown et al. 2012

3.21.5.2.1 STONY RIVER

Stony River is located on the north bank of the Kuskokwim River, 2 miles north of its junction with the Stony River. The village is 100 miles east of Aniak, 185 miles northeast of Bethel, and 225 miles west of Anchorage. One of the smallest villages in the subregion, Stony River had a population of 42 in 2010. In March 2010, researchers from ADF&G surveyed 12 of 20 households in Stony River. Questions on the survey pertained to harvests obtained in 2009. Expanding for the 8 unsurveyed households, Stony River's estimated total harvest in 2009 was approximately 33,726 pounds with an average per household harvest of 1,686 pounds. The average household income was $19,695 (Brown et al. 2012).

Species Harvested and Used: Every resident in Stony River reported harvesting at least one wild resource in 2009, and 83 percent reported that a household member had harvested wild foods. Fish was the most widely used resource (100 percent). Ninety-two percent of households said they used land mammals and some form of edible plant, and 75 percent said they used birds and eggs. In terms of harvesting wild foods, 58 percent of households said they harvested fish, 50 percent harvested land mammals, 83 percent harvested vegetation, and 67 percent said they harvested birds (Brown et al. 2012). No one reported a harvest of eggs (Table 3.21-4).

Four species of salmon contributed 68 percent of the total community harvest. Chinook salmon contributed more than any other single species (Figure 3.21-6). In terms of edible pounds, fish were the largest category of wild resource harvested in terms of edible pounds (86 percent of the total community harvest), followed by land mammals, edible plants, and birds (Brown et al. 2012).



Source: Brown et al. 2012, Figure 9-1. Top 10 Species harvests ranked by estimated edible weight, Stony River, 2009.

Figure 3.21-6: Composition of Stony River Subsistence Harvest, 2009

Table 3.21-4: Percentage of Households Using, Harvesting, Giving, and Receiving Subsistence Resources by Category, Stony River, 2009

	Percentage of households, N* 20			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	58%	50%	33%	25%
Chum	58%	41%	25%	17%
Coho	67%	50%	25%	25%
Sockeye	58%	50%	33%	17%
Pink	25%	25%	17%	0%
Unknown salmon	33%	0%	0%	33%
Non-Salmon				
Whitefish	68%	33%	17%	50%
Sheefish	58%	42%	17%	25%
Smelt	0%	0%	0%	0%
Land & Marine Mammals				
Black bear	8%	8%	8%	0%
Caribou	42%	8%	0%	33%
Moose	50%	8%	25%	41%
Beaver	42%	33%	42%	0%
Hare	0%	0%	0%	0%
Muskrat	0%	0%	0%	0%
Seals	0%	0%	0%	0%
Birds				
Ducks	50%	42%	25%	17%
Geese	25%	17%	8%	8%
Upland birds	75%	67%	17%	17%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	84%	75%	8%	33%
Plants/greens/mushrooms	58%	58%	17%	17%
Wood	83%	83%	17%	17%

Notes:
*N = number of households in the community
Source: Brown et al. 2012

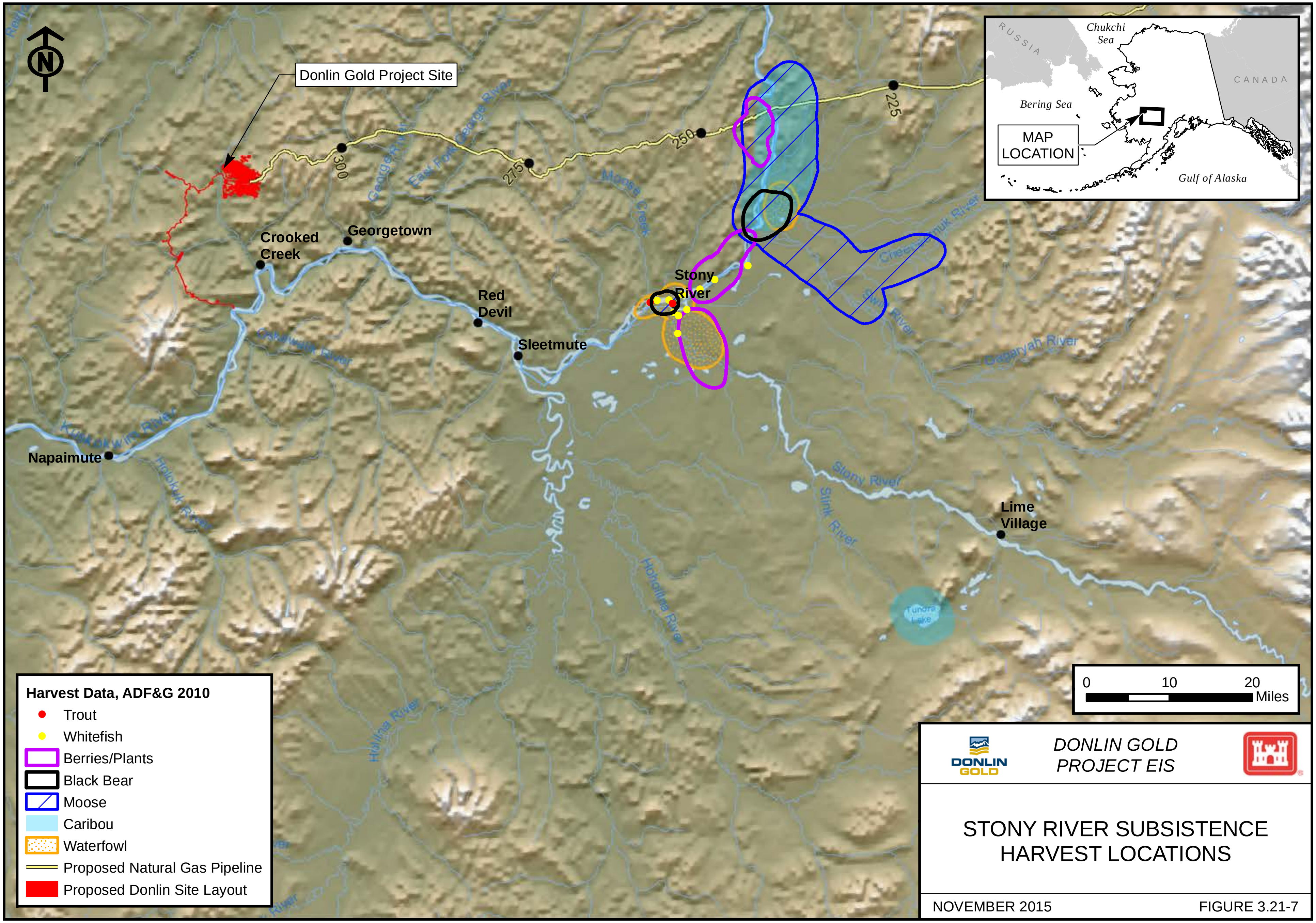
Harvest Areas: In 2009, residents of Stony River reported using an area of 487 square miles Moose were hunted on the eastern border of GMU19A and western portion of 19D covering a small area just down river from the community of Stony River and portions of the Swift River, Tatlawiksuk River, and Kuskokwim River (Figure 3.21-7). Hunters tried to harvest moose close to the river so as not to have to pack the carcass too far. Small land mammals, particularly beaver and marten were harvested north of Stony River and upriver from the village. Since trapping in no longer as remunerative as it once was trapping areas have shrunk (Brown et al. 2012).

Salmon harvests were concentrated along the main stem of the Kuskokwim River with some families traveling up the Stony River to fish (Figure 3.21-8). Some residents reported fishing for non-salmon fish species down river from Stony River village, particularly near the junction of the Kuskokwim and Stony rivers. Most fish were caught in gillnets, however, residents also used rod and reel and jigging gear (Brown et al. 2012).

Sharing: There was no discussion on wild food networks because of confidentiality issues. Ninety-two percent of households reported they received resources, while 67 percent gave away resources (Brown et al. 2012).

Variability: Stony River residents reported that for all resource categories, except land mammals and vegetation, they "got enough" during 2009 (Brown et al. 2012). Poor weather seems to have been the main factor influencing people's harvest of vegetation.

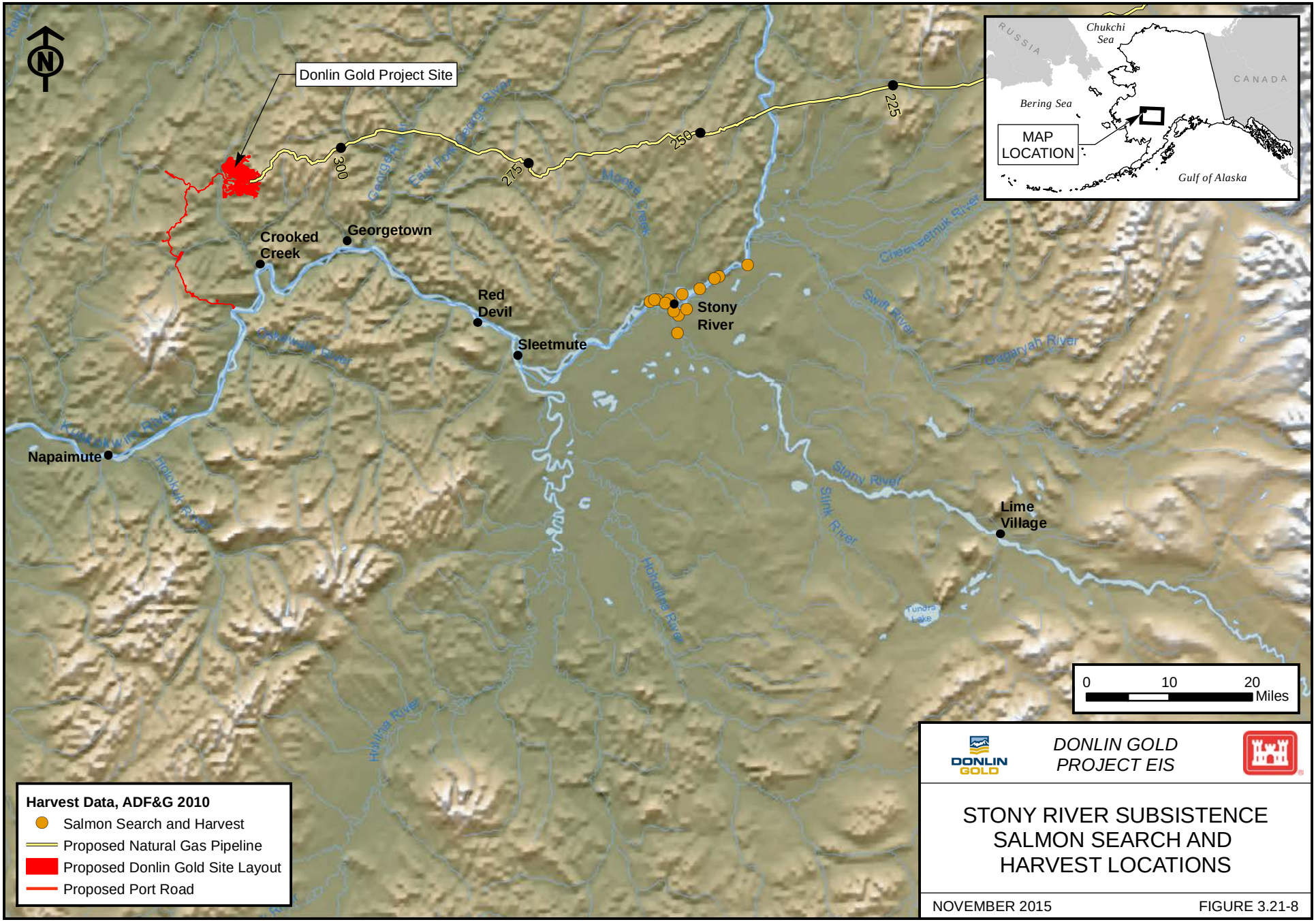
The reason people said they did not get enough land mammals was resource availability. Moose hunting in 2009 was limited by extremely low water levels that restricted access, warm weather that slowed moose movements, a generally low moose population in GMU19A, and the continued closure in a large part of that GMU (Brown et al. 2012). In general, there has been a decline in moose and caribou harvests by Stony River residents since 2003, when ADF&G began collecting data. In 2005, 67 percent of households reported harvesting moose but in 2009 only 25 percent reported a harvest while 67 percent reported attempting to harvest (Brown et al. 2012). Data on Stony River salmon harvests collected between 2000 and 2009 show fluctuation in harvests for all species but an overall increase.



STONY RIVER SUBSISTENCE HARVEST LOCATIONS

NOVEMBER 2015

FIGURE 3.21-7


Donlin Gold Project Site
300
275
250
225
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
Napaimute
Lime Village
Kuskokwim River
Holitna River
Hoholitna River
Stony River
Stink River
Swift River
Cheeneetnuk River
Gagaryah River
Moose Creek
East Fork George River
Tundra Lake
RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
0
10
20
Miles
Harvest Data, ADF&G 2010
Salmon Search and Harvest
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
DONLIN GOLD
DONLIN GOLD PROJECT EIS
STONY RIVER SUBSISTENCE SALMON SEARCH AND HARVEST LOCATIONS
NOVEMBER 2015
FIGURE 3.21-8

3.21.5.2.2 SLEETMUTE

Sleetmute is located on the east bank of the Kuskokwim River, 1.5 miles north of its junction with the Holitna River. It lies 79 miles east of Aniak, 166 miles northeast of Bethel, and 243 miles west of Anchorage. Sleetmute was originally settled by Athabascan Indians, most likely Deg Hit'an or Dena'ina, with interior Yup'ik people moving into this part of the river in the late 19th and early 20th century (Oswalt 1980a; Brown et al. 2012). Inter-marriages between Yup'ik and Athabascan speakers occurred in the early to mid-20th century, and children typically grew up speaking the Yup'ik language of their mothers. In 2010, the population was 86.

In 2010, 32 of 37 households participated in the household survey covering the harvest activities of the year 2009 (Brown et al. 2012). Expanding for the five unsurveyed households, Sleetmute's estimated total harvest in 2009 was approximately 36,547 pounds with an average per household harvest of 988 pounds. The average household income was $35,690 (Brown et al. 2012).

The current data set collected by the Division of Subsistence (Brown et al. 2012) did not include a seasonal round, so Figure 3.21-9 represents data collected in 1982-83. It shows that people fish for non-salmon fish species year-round.

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Moose	--	--	--	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--
Caribou	--	--	--	--	--	--	--	--	--	--	--				--									
Black and Brown Bear						--	--	--	--	--	--													
Porcupine	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Snowshoe Hare																								
Grouse																								
Ptarmigan																								
Waterfowl							--	--	--	--														
Mink																								
Marten																								
Wolf																								
Wolverine																								
Land Otter																								
Red Fox																								
Lynx																								
Beaver																								
Muskrat																								
Salmon																								
Lamprey																								
Sheefish																								
Least Cisco	--	--	--	--	--	--	--	--	--	--	--	--					--	--	--	--	--	--	--	--
Whitefish	--																	--	--	--	--	--	--	--
Rainbow Trout																								

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Arctic Char																								
Grayling																								
Smelt																								
Blackfish															--	--	--	--	--	--				
Pike																								
Sucker																								
Burbot																								
Greens																								
Berries																								

Notes:
Shaded cells denote concentrated use
-- denotes intermittent use

Source: Charnley 1983.

Figure 3.21-9: Sleetmute and Chuathbaluk Seasonal Round of Subsistence Harvests, 1982-83

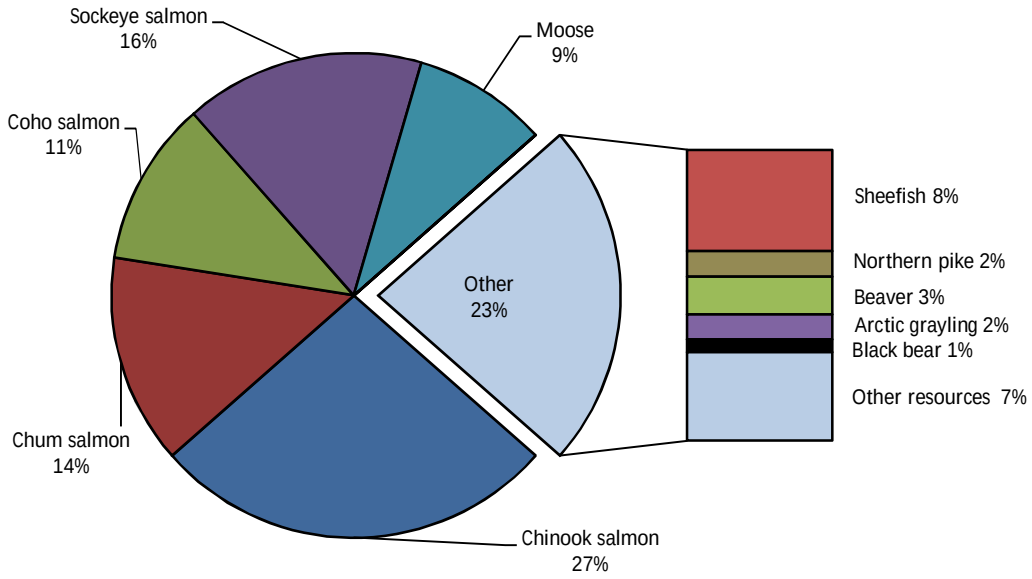
Species Harvested and Used: One hundred percent of households used some kind of wild food, and 100 percent of households said that a member of that household had harvested wild food. Important subsistence resources included salmon (used by 91 percent of households); whitefish (84 percent); and large land mammals (63 percent), including moose (56 percent) (Brown et al. 2012). Seventy-five percent of households said they harvested sockeye salmon, 63 percent reported a harvest of sheefish, while only 16 reported a harvesting moose (Table 3.21-5). The harvest and use of moose was reported to have much more prevalent in the past and several residents reported that prior to moose hunting closure in GMU 19A, moose were the primary subsistence resource in the village (Brown et al. 2012).

Table 3.21-5: Percentage of Households Using, Harvesting, Giving, and Receiving Subsistence Resources by Category, Sleetmute, 2009

	Percentage of households, N* 37			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	88%	69%	41%	38%
Chum	69%	53%	22%	25%
Coho	72%	63%	25%	25%
Sockeye	91%	75%	47%	41%
Pink	9%	6%	3%	6%
Unknown salmon	0%	0%	0%	0%
Non-Salmon				
Whitefish	69%	38%	19%	50%
Sheefish	79%	63%	35%	35%
Smelt	3%	0%	0%	3%
Land & Marine Mammals				
Black bear	38%	19%	16%	19%
Caribou	3%	3%	3%	3%
Moose	56%	16%	19%	50%
Beaver	44%	38%	25%	13%
Hare	22%	19%	3%	3%
Muskrat	3%	3%	0%	0%
Seals	0%	0%	0%	0%
Bird				
Ducks	41%	31%	6%	16%
Geese	22%	19%	0%	3%
Upland birds	69%	63%	13%	22%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	75%	69%	22%	29%
Plants/greens/mushrooms	56%	50%	16%	22%
Wood	66%	63%	63%	25%

Notes:
*N = number of households in the community
Source: Brown et al. 2012.

Four species of salmon accounted for an estimated 68 percent of the total harvest while moose accounted for an additional 9 percent. Other resources, including sheefish, northern pike, beaver, Arctic grayling, and black bear made up 23 percent of the total edible harvest (Brown et al. 2012) (Figure 3.21-10). Notable is the harvest and use of beaver (used by 44 percent of households) and black bears (used by 38 percent of households). Residents reported that beaver were harvested primarily for their meat rather than their pelts. An assortment of edible plants was harvested in 2009 including blueberries, high bush cranberries, currants, wild rhubarb, rose hips, and Hudson's Bay tea (Brown et al. 2012).



Source: Brown et al. 2012, Figure 8-1. Top 10 species harvests ranked by estimated edible weight, Sleetmute, 2009.

Figure 3.21-10: Composition of Sleetmute Subsistence Harvest, 2009

Subsistence salmon fishing is a critical part of the livelihood of Sleetmute residents: "we really work at it, that's all our life in the summertime, salmon" (Brown et al. 2012). Most effort was directed at the harvest of Chinook and sockeye salmon, with coho, and chum salmon pursued less intently. People said they preferred Chinook salmon over coho, because the latter did not preserve well. Residents reported that chum salmon harvests had declined because people relied less on dog teams (Brown et al. 2012). Most fish (87 percent) were harvested by gillnet while 12 percent were harvested with rod and reel. Sleetmute residents used both drift gillnets and setnets, shifting their nets in response to water levels and river flow.

Large land mammals comprised only 11 percent of the total harvest in the 2009 study year, while small land mammals made up 4 percent. Black bear was the most frequently harvested large land mammal (16 percent of households, but used by 38 percent), with residents harvesting an estimated five animals in 2009. Black bear are usually harvested in the spring. Some residents pointed out that the decline in moose had prompted their harvest of black bear, but not all residents were interested in harvesting black bear. Brown bears, on the other hand, are less commonly harvested today, as one resident explained.

> *There's something wrong with them brown bears in our religion, in our belief, in our tradition, we never eat them. Only if you are starving and when you cook it you have to put holy water so it is blessed so you can eat it* (quoted in Brown et al. 2012).

The community harvested six moose in 2009 (Brown et al. 2012). Some 34 percent of households reported attempting to harvest moose and 16 percent were successful. Most success was reported in September although moose harvests also occurred in June and July. Areas most accessible to Sleetmute hunters for moose hunting in GMU 19A were closed to hunting in 2006. For this reason reported 2009 harvests reflect the efforts of hunters operating under a moratorium and do not reflect a normal level of community reliance on moose (Brown et al. 2012).

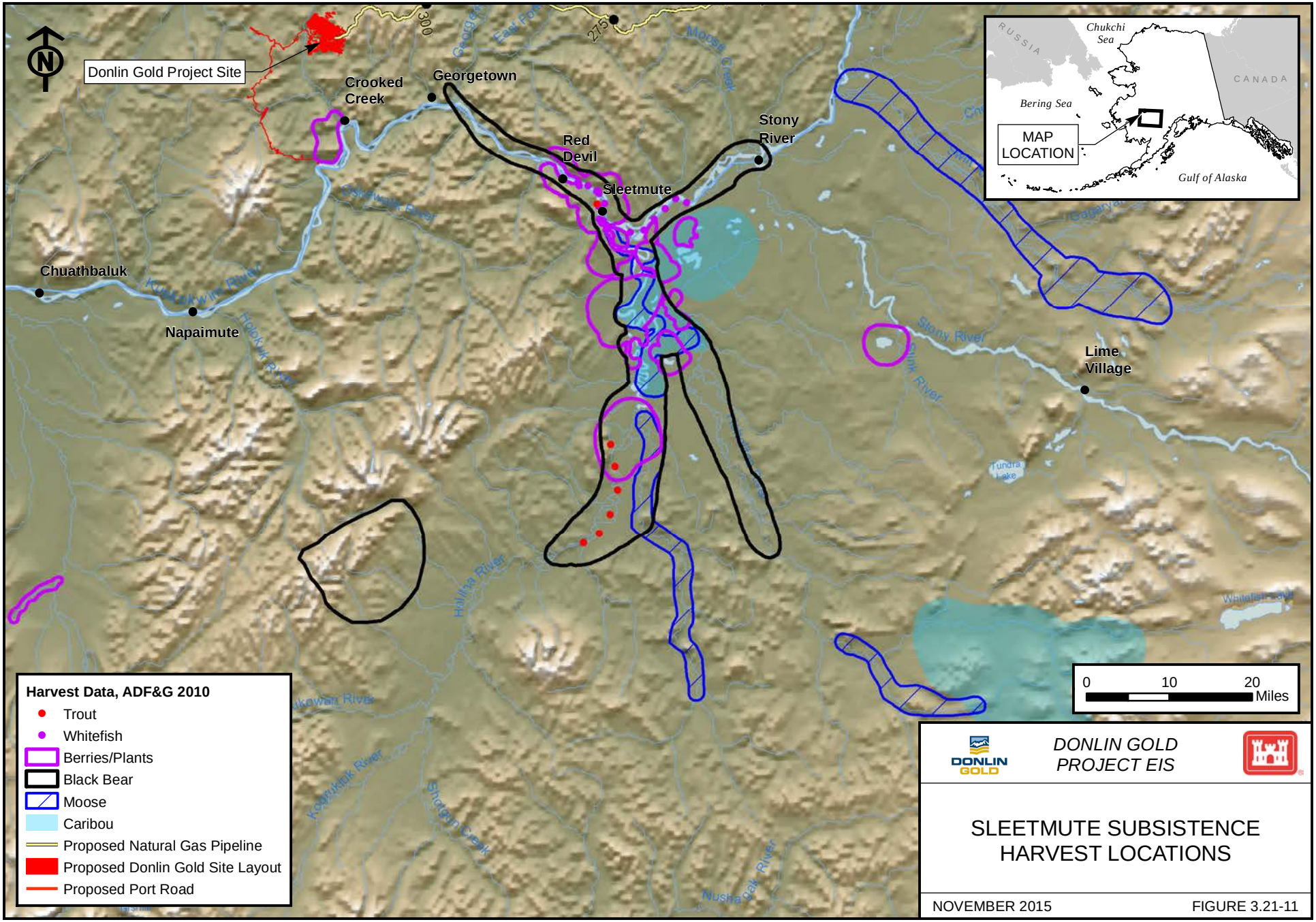
Harvest Areas: In 2009, Sleetmute residents reported using a total of 1,712 square miles for subsistence. A majority of resources were harvested within a 20-mile radius of the community but residents also reported traveling 100 miles or more in search of wild food.

Hunting areas for moose, black bear, and caribou overlapped. This area included the Kuskokwim River corridor and various tributaries such as the Holitna, Hoholitna, and Swift river corridors, the drainage of Titnuk Creek, and the Door Mountains near the upper reaches of the Hoholitna River (Figure 3.21-11). As noted above, most of this area has been closed to moose hunting since 2006. However, the use area data do not necessarily represent illegal moose harvests, since hunters may have been hunting for other species, or they may have been hunting for ceremonial purposes (Brown et al. 2012).

Fishing for salmon and non-salmon fish species was largely conducted close to the community (Figure 3.21-12). Quality driftnet and setnet fishing sites were found in the direct vicinity of the town so there was no need to travel far to obtain salmon, sheefish, or whitefishes (Brown et al. 2012). Driftnets and setnets were used downriver from the village while setnets were used at the mouth of the Holitna River, slightly upriver from the village. Salmon were harvested primarily with nets, while rod and reel was used, for the most part, to harvest non-salmon fish species. Residents also reported fishing up the Holitna and Stony rivers.

Sharing: Sharing and the exchange of subsistence foods among community members and neighboring villages is an important practice among Middle Kuskokwim communities (Jonrowe 1980; Stickney 1981; Charnley 1984). Both fish and moose meat were reported to be widely shared among residents of Sleetmute. Residents said that sharing wild foods was particularly important and there is a tradition of giving the first Chinook salmon harvest of the season to an elder (Brown et al. 2012).

In Sleetmute, an estimated 31 percent of the households harvested 70 percent of the wild foods, suggesting there was a core of specialized harvesting households. In Figure 3.21-13, these high harvesting households are depicted as larger nodes. As in many other Native communities, these high harvesting households in Sleetmute are active households headed by a mature married couple or an active single male. These households shared their harvests with other households, and also received resources or service from other households, a pattern indicated by the many locations close to the center of the diagram (Brown et al. 2012).


Donlin Gold Project Site
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
Chuathbaluk
Napaimute
Lime Village
Kuskokwim River
Holokuk River
Stony River
Moose Creek
Hallina River
Kogrukluk River
Shotgun Creek
Nushagak River
Tundra Lake
Whitefish Lake
300
275
RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
Harvest Data, ADF&G 2010
Trout
Whitefish
Berries/Plants
Black Bear
Moose
Caribou
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
0
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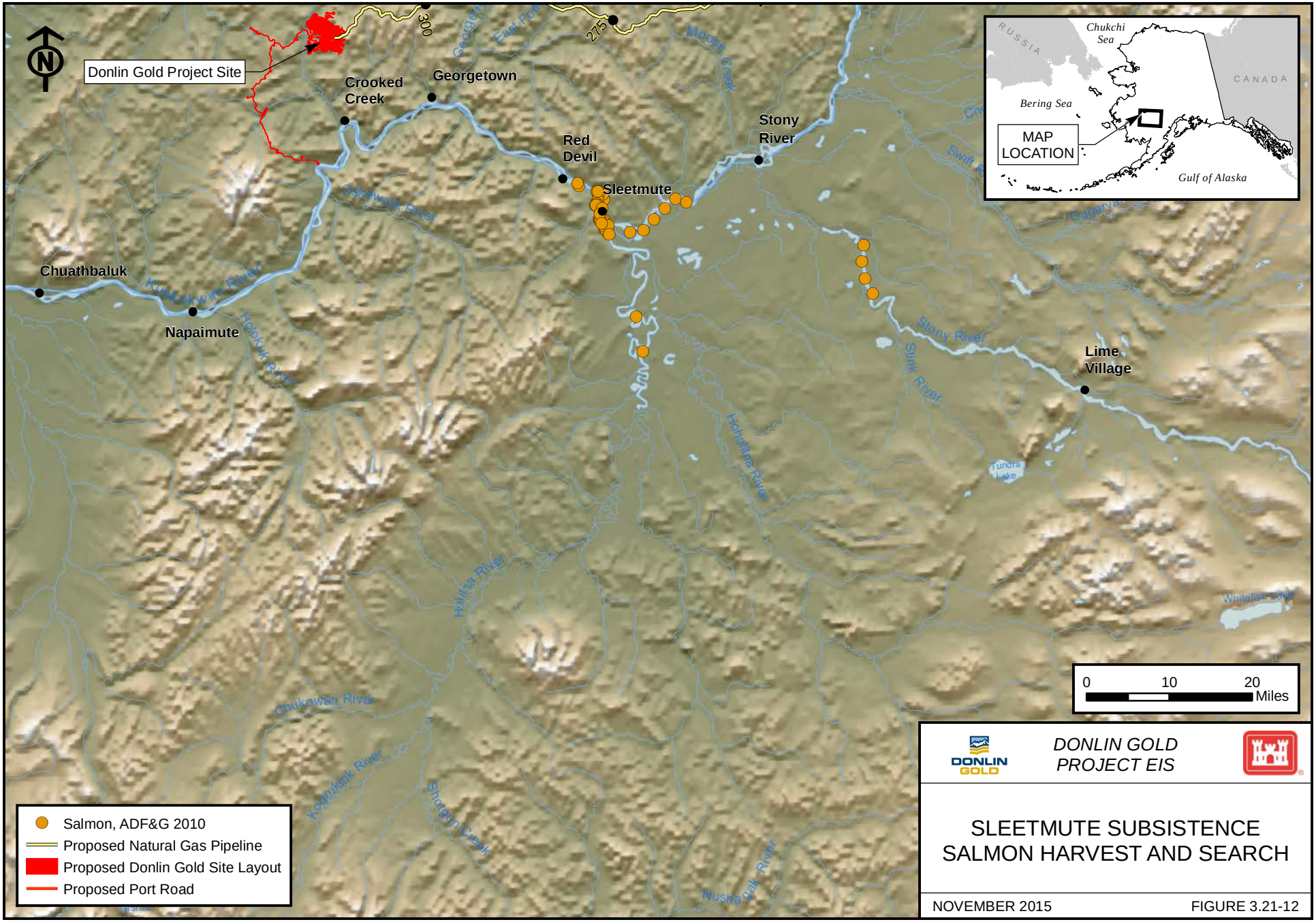
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
SLEETMUTE SUBSISTENCE HARVEST LOCATIONS
NOVEMBER 2015
FIGURE 3.21-11



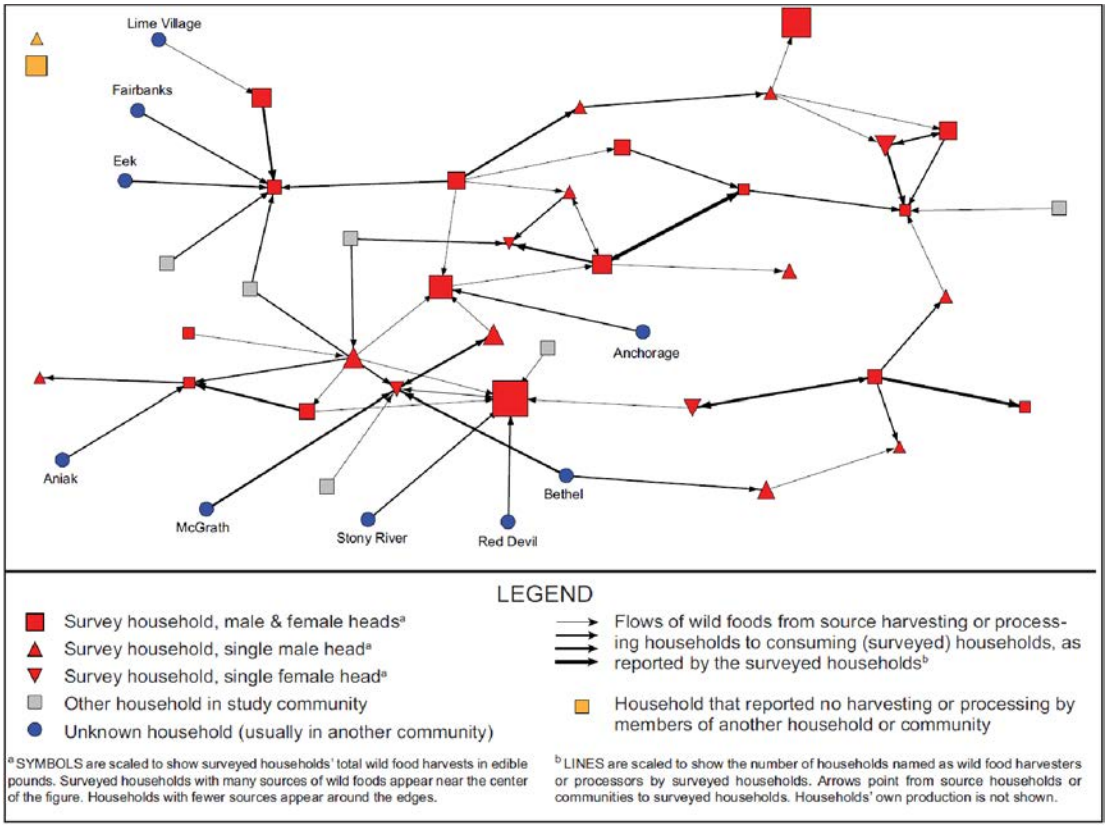
DONLIN GOLD

DONLIN GOLD PROJECT EIS

SLEETMUTE SUBSISTENCE SALMON HARVEST AND SEARCH

NOVEMBER 2015

FIGURE 3.21-12



Data Sources: Brown et al. (2012)

DONLIN GOLD

DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK SLEETMUTE, 2009

NOVEMBER 2015 FIGURE 3.21-13

Variability: Between 2000 and 2009, data show that salmon harvests in Sleetmute fluctuated but slowly increased. After 2003 salmon harvests show a greater annual variation punctuated by declining or low per capita estimates in 2004, 2005, and 2007. There are various reasons for the variability, but ethnographic data collected in 2010 suggested that the increase in the salmon harvest was to compensate for loss of the availability of moose meat (Brown et al. 2012). While salmon harvests have increased the data show that harvests of burbot and Dolly Varden have declined in recent years. Residents reported that most non-salmon species were no longer as intensely fished as they once were and the current harvests of white fish and pike were now generally the result of incidental harvests during salmon fishing (Brown et al. 2012).

In the 1980s, moose were considered the primary source of protein for Central Kuskokwim communities and salmon an "alternate" resource (Stickney 1981; Charnley 1983, 1984). As in Nikolai, moose was prized above all other foods. In 2009, one Sleetmute resident said, "*Certainly for us, living out here, moose have always been an integral part of what made life good out here*" (Brown et al. 2012). Since the 1980s moose harvests in Sleetmute have declined precipitously from 134 pounds per person in 1983, to 69 pounds in 2003, to 0 in 2005 (Brown et al. 2012). In 2009, the per capita harvest was 35 pounds, but all households reported using less moose meat and not getting enough. Residents attributed the decline in moose to hunting pressure from non-local residents (particularly in GMU 18), and predation. They agreed with the closure in GMU 19A and but were conflicted about illegal hunts (the community needs and desires moose meat), and the criminalization of those hunts. They were also concerned that the data collected in 2010 was not representative and did not accurately represent community reliance on moose or the areas traditionally used to hunt moose (Brown et al. 2012). Residents pointed out that the areas now open to hunting were too far away making it a financial hardship to hunt. As one resident stated, "*When you can't hunt locally it goes against many of the aspects which are fundamental about subsistence*" (Brown et al. 2012). Residents said that if moose hunting were to reopen that it should be limited to local residents.

3.21.5.2.3 CROOKED CREEK

Crooked Creek is located on the north bank of the Kuskokwim River at its junction with Crooked Creek. It is 50 miles northeast of Aniak, 141 miles northeast of Bethel, and 275 miles west of Anchorage. In 2010, Crooked Creek had a population of 90. In 2010, researchers surveyed 33 of 40 households, reporting on harvests during 2009. Expanding for the 7 unsurveyed households, Crooked Creek's estimated total harvest in 2009 was approximately 28,259 pounds or an average household harvest of 706 pounds (Brown et al. 2012). The average household income was $25,803 (Brown et al. 2012).

The seasonal round of harvest shows that food harvests are distributed widely across the year and across many species (Figure 3.21-14). Concentrated effort occurs in periods of optimal availability and primeness for food or furs. As examples, large mammals are taken in seasonal windows throughout the year, while fur-bearers are taken in winter. Salmon harvests are concentrated in the summer, along with many other fish species, while other fish species are taken in winter.

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Caribou	--	--																			--	--	--	--
Bear (black & brown)			--	--			--	--	--	--														
Moose	--	--									--	--									--	--		
Beavers																								
Land Otter																								
Lynx	--	--																						
Marten	--	--																						
Muskrat			--	--			--	--																
Red Fox	--	--																						
Wolf	--	--																						
Wolverine	--	--																						
Chum, Red					--	--					--	--												
Chinook					--	--			--	--	--	--												
Coho					--	--	--	--		--			--	--	--	--								
Burbot	--	--	--	--	--	--																	--	--
Dolly Varden	--	--	--	--	--	--	--	--							--	--								
Grayling	--	--															--	--			--	--	--	--
Lamprey											--	--												
Pike	--	--	--	--			--	--	--	--							--	--						
Sheefish			--	--							--	--	--	--										
Sucker																								
Whitefish	--	--	--	--			--	--	--	--							--	--						
Grouse	--	--									--	--												
Porcupine	--	--	--	--			--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--
Ptarmigan	--	--																						
Snowshoe Hare					--	--					--	--												
Waterfowl			--	--			--	--	--	--	--	--			--	--	--	--						
Other edible-plants			--	--			--	--	--	--	--	--	--	--										
Non-edible plants																								
Berries							--	--	--	--					--	--								
Firewood																								

Source: Brelsford et al. 1987

Figure 3.21-14: Crooked Creek Seasonal Round of Subsistence Harvests, 1964-1986

Species Harvested and Used: Of households surveyed in Crooked Creek, 97 percent reported using a wild resource and 94 percent reported a harvest of wild foods. The most widely used resource category was vegetation (97 percent), followed by fish (94 percent), land mammals (79 percent), and birds and eggs (39 percent). In terms of specific resources used by households, wood was the most widely used resource (85 percent) followed by Chinook salmon (82 percent) berries (73 percent), chum (70 percent) and coho salmon (70 percent) (Table 3.21-6). Note, some residents said that 2009 was a "bad berry year" citing a warming environment and less rain (Brown et al. 2012).

Important examples of rate of harvesting resources include 70 percent of households that reported harvesting berries, 61 percent reported harvesting Chinook salmon, while 52 percent said they harvested sheefish, and 32 percent harvested beaver. Only 9 percent of households reported a harvest of moose. Very few households reported using caribou and there was no reported harvest of these animals (Brown et al. 2012).

Table 3.21-6: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Crooked Creek, 2009

	Percentage of households, N* 40			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	82%	61%	30%	30%
Chum	70%	55%	18%	21%
Coho	70%	55%	21%	24%
Sockeye	67%	55%	24%	21%
Pink	6%	6%	3%	0%
Unknown salmon	0%	3%	0%	0%
Non-Salmon				
Whitefish	52%	24%	9%	36%
Sheefish	62%	52%	36%	18%
Smelt	3%	0%	0%	3%
Land Mammals				
Black bear	36%	15%	18%	24%
Caribou	6%	0%	0%	6%
Moose	64%	9%	12%	58%
Beaver	52%	33%	21%	27%
Hare	13%	7%	3%	7%
Muskrat	7%	7%	0%	0%
Marine Mammals				
Seals	7%	0%	0%	7%
Birds				
Ducks	21%	19%	12%	10%

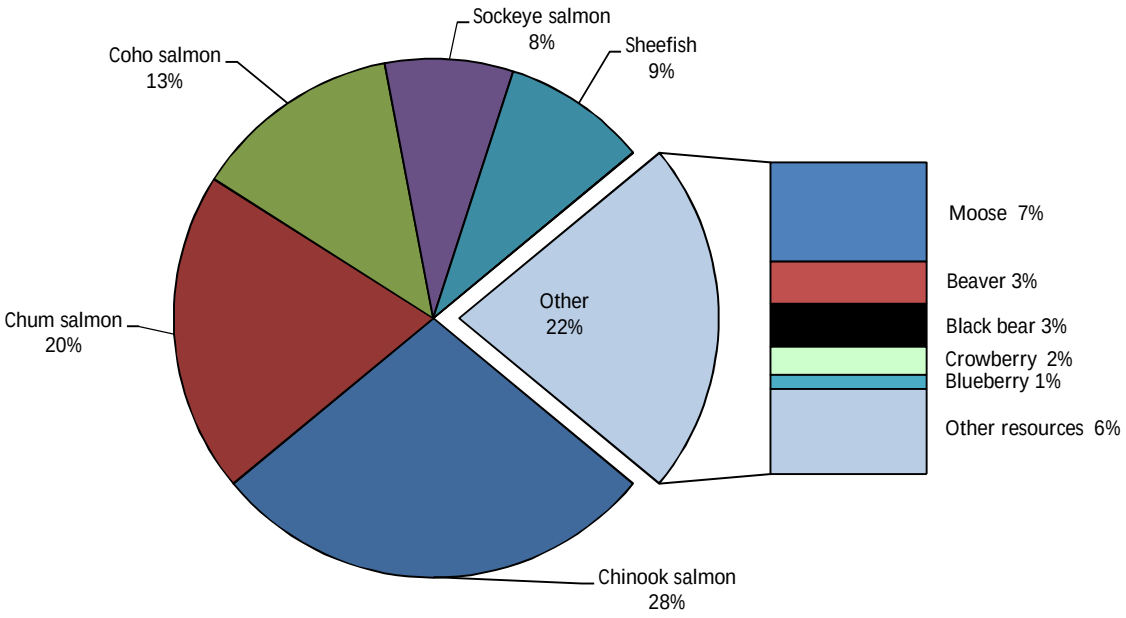
Table 3.21-6: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Crooked Creek, 2009

	Percentage of households, N* 40			
	Using	**Harvesting**	**Giving away**	**Receiving**
Geese	19%	16%	3%	7%
Upland birds	36%	30%	15%	7%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	73%	70%	42%	13%
Plants/greens/mushrooms	61%	59%	30%	13%
Wood	85%	79%	36%	30%

Notes:
*N = number of households in the community
Source: Brown et al. 2012.

Five species of fish: Chinook, chum, coho, sheefish, and sockeye salmon accounted for 78 percent of the total subsistence harvest in 2009. The remaining 22 percent was made up of Moose (7 percent), black bear (3 percent) and beaver (3 percent), various species of berries and other resources, such as birds, marine mammals, and marine invertebrates (Figure 3.21-15).

Harvest Areas: Residents of Crooked Creek reported using a total of 1,245 square miles for subsistence activities in 2009 (Brown et al. 2012) (see Figure 3.21-16). According to residents, the area documented in 2009 did not represent their entire traditional territory, which was much broader, and had been affected by regulations, changes in the environment and local animal populations, as well as economic considerations, such as the price of gasoline. Closure of GMU 19A has curtailed moose hunts above the George River and the Holitna and Hoholitna basins (Brown et al. 2012). Moose are now hunted further down river and in the Bonanza flats and Donlin Creek areas (Brown et al. 2012).



Source: Brown et al. 2012. Figure 5-1.-Top 10 species harvests ranked by estimated edible weight, Crooked Creek, 2009.

Figure 3.21-15: Composition of Crooked Creek Subsistence Harvest, 2009

Land mammals were harvested over a large area including the mainstem of the Kuskokwim River and its tributaries both downstream and upstream from the village. Hunting areas for many species overlapped. Crooked Creek hunters said they hunted for moose on the mainstem of the Kuskokwim River as far down river as the community of Lower Kalskag and as far upriver as the George River. Particular tributaries of the Kuskokwim used for moose hunting were the Holitna, Hoholitna and George rivers. Black bears were hunted primarily along Crooked Creek and in the Oskawalik River (Figure 3.21-16). Beaver were hunted along parts of Crooked Creek and on the George River (Brown et al. 2012).

A majority of fish was harvested with gillnets (78 percent), while rod and reel accounted for 20 percent of the total fish harvest. Fish were also harvested with jigs used during the winter through a hole in the ice. Salmon were harvested primarily in the mainstem of the Kuskokwim River from just below the mouth of the Oskawalik River upstream to the mouth of George River, with the heaviest fishing taking place along the Great Bend (Figure 3.21-17). Non-salmon fish species were also harvested in the mainstem of the Kuskokwim, but specific species such as Arctic Grayling were harvested up the George River or in Crooked Creek, particularly at the confluence of Crooked Creek and the Kuskokwim. Sheefish were harvested in the spring primarily in the Great Bend in front of the village (Brown et al. 2012).

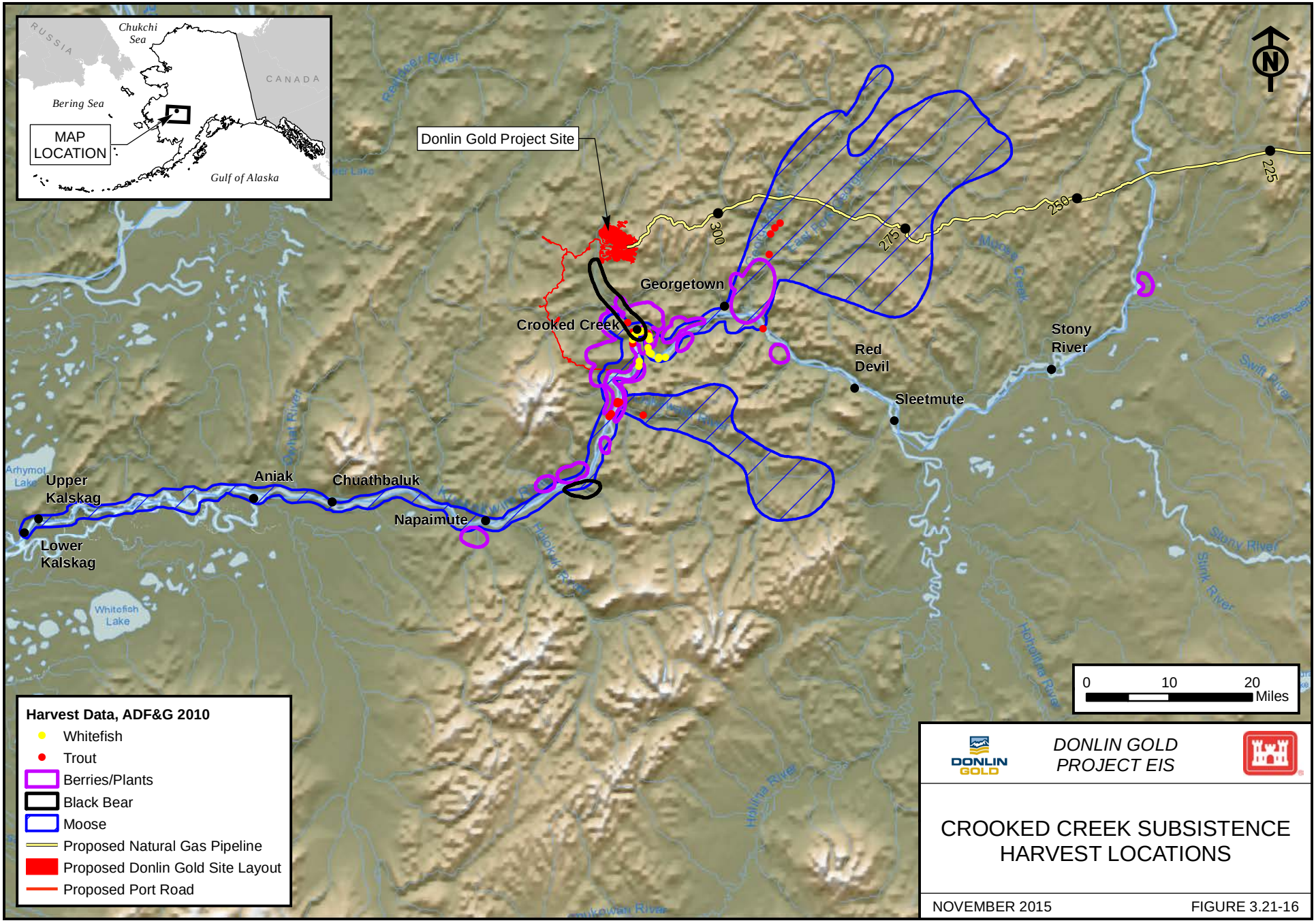
Berry and plant harvesting took place both near the community and in areas within one day's travel by boat. Some respondents reported going farther than usual in 2009 to harvest greens and berries. Some popular locations were in the Canoe Hills area and in the hills directly across the Kuskokwim River from the community. Some residents reported traveling by boat downstream to an area between the Oskawalik River and Napaimute, and as far upstream as midway between the George River and the community of Red Devil (Brown et al. 2012).

Sharing: In most Kuskokwim communities, households use wild foods that are harvested by others and distributed through sharing networks. For this reason the percentage of households harvesting is usually lower than the percentage using. In Crooked Creek, 29 percent of the households harvested 70 percent of the wild resources. The highest producing households in Crooked Creek were several mature households with male and female heads, represented by large red squares, and one single male household, represented by a triangle in the lower section of the diagram (Figure 3.21-18).

Variability: While a majority of Crooked Creek residents interviewed by ADF&G staff in 2010 reported that they "got enough" wild foods in 2009, 42 percent of households said they did not get enough salmon. Residents attributed the shortage of salmon to various factors including: increased commercial fishing, and a lack of money, gear, or time to go fishing. Residents pointed out that summer salmon fishing conflicted with periods of high employment when residents left the community to work. According to data collected by ADF&G, the 2009 salmon harvest was lower than previous years but still the third highest since 2000 (Brown et al. 2012).

Some residents also said they did not get enough moose or caribou in 2009. Residents did not report a harvest of caribou but said they received caribou meat from friends. Residents said that caribou were more plentiful in the past and attributed the change to changes in migration routes, and to low-flying aircraft that diverted the herds (Brown et al. 2012). Noise pollution was also a reason given for residents not getting enough birds and eggs and for the decline in moose.

Many residents felt that moose populations were on the decline near Crooked Creek. One resident thought the decline in moose population was due to competition from non-local hunters, lack of predator control, and increased noise from motorized vehicles such as boats, planes, and all-terrain vehicles. Data on subsistence moose harvests for 2003, 2004, 2005, and 2009 show them to be highly variable. Harvests in 2009 were consistent with 2004 levels (Brown et al. 2012).


RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
Donlin Gold Project Site
Georgetown
Crooked Creek
Red Devil
Sleetmute
Stony River
Aniak
Chuathbaluk
Napaimute
Upper Kalskag
Lower Kalskag
Arhymot Lake
Whitefish Lake
Reindeer River
Moose Creek
Swift River
Stony River
Stink River
Holitna River
Kuskokwim River
Harvest Data, ADF&G 2010
Whitefish
Trout
Berries/Plants
Black Bear
Moose
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
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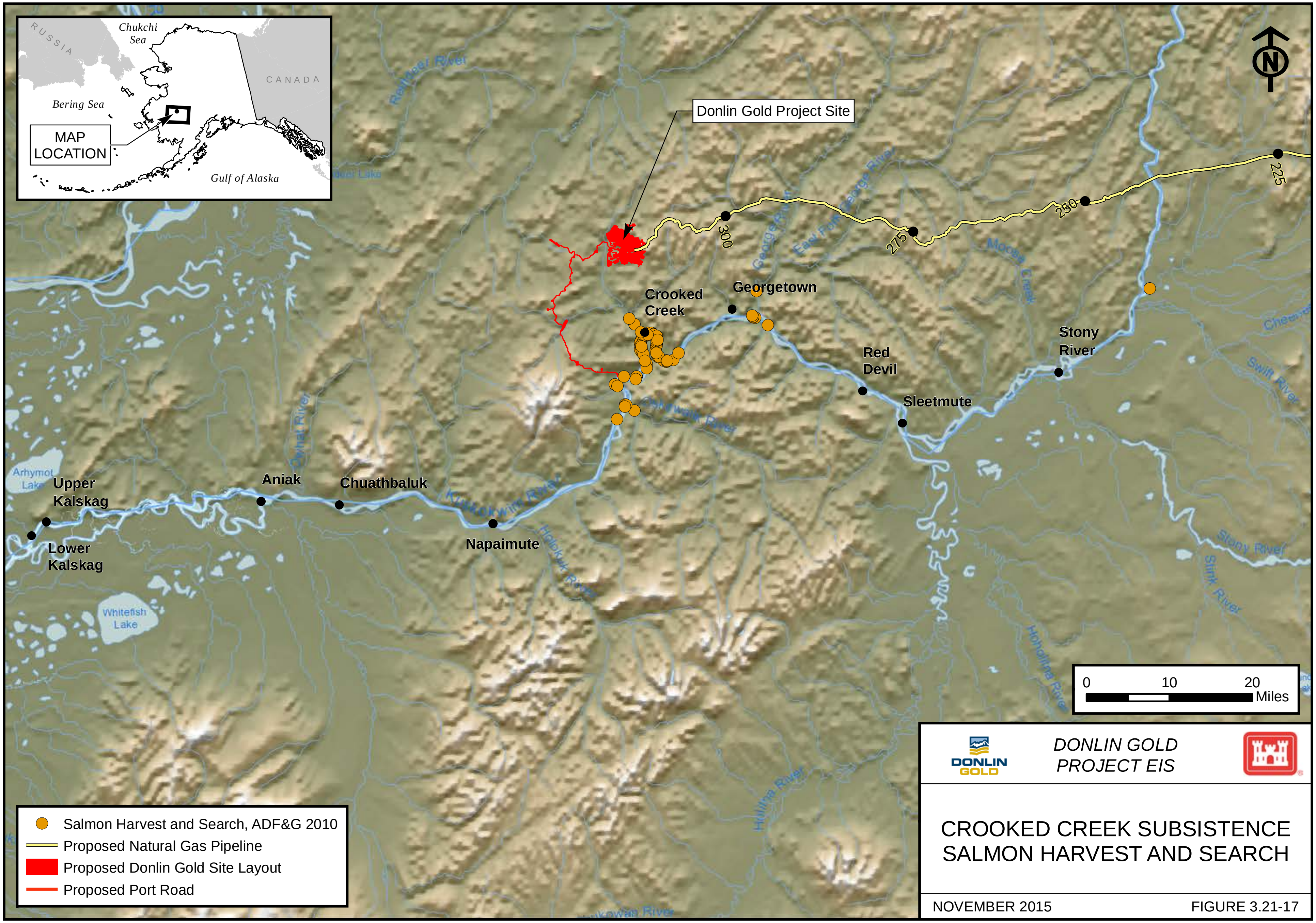
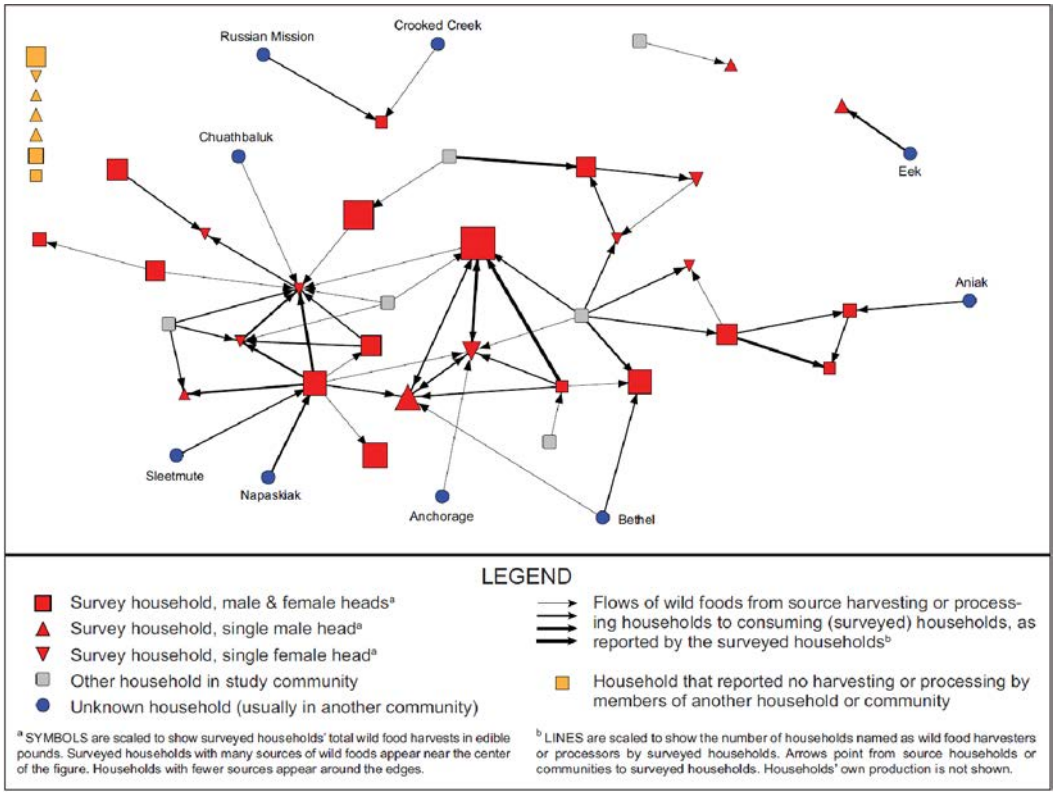
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
CROOKED CREEK SUBSISTENCE HARVEST LOCATIONS
NOVEMBER 2015
FIGURE 3.21-16



CROOKED CREEK SUBSISTENCE SALMON HARVEST AND SEARCH

NOVEMBER 2015

FIGURE 3.21-17



Data Sources: Brown et al. (2012)

DONLIN GOLD

DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK CROOKED CREEK, 2009

NOVEMBER 2015 FIGURE 3.21-18

3.21.5.2.4 ANIAK

Aniak is the largest community in the Central Kuskokwim region located about 317 miles west of Anchorage and 92 miles from Bethel. By virtue of its size and infrastructure, Aniak serves as a hub for several nearby smaller communities. The population of Aniak is primarily Yup'ik. In 2009, the population was estimated at 501 people. In 2009, researchers from ADF&G surveyed 141 of 170 households in Aniak. Expanding for the 29 unsurveyed households, Aniak's estimated total wild food harvest was 147,316 pounds with an average household harvest of 1,498 pounds. The average household income was $58,018 (Brown et al. 2012).

Species harvested and used: Aniak households used an average of 10 subsistence resources during 2009 and harvested and average of 8. The most widely used resource category was fish (92 percent), which was also the resource most commonly harvested (79 percent). The next most widely used resource categories were vegetation (80 percent) and land mammals (76 percent). Forty-eight percent of households said they used birds and eggs. Percentages of Aniak households using, harvesting, giving, and receiving specific subsistence resources are shown in Table 3.21-7.

Table 3.21-7: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Aniak, 2009

	Percentage of Households, N* 170			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	79%	61%	30%	39%
Chum	40%	35%	12%	6%
Coho	81%	69%	21%	32%
Sockeye	50%	40%	14%	17%
Pink	6%	6%	1%	1%
Non-Salmon				
Whitefish	50%	28%	15%	30
Smelt	14%	6%	6%	6%
Land Mammals				
Black Bear	11%	6%	3%	7%
Caribou	8%	1%	2%	6%
Moose	72%	21%	24%	57%
Beaver	13%	8%	4%	8%
Hare	9%	8%	3%	3%
Muskrat	3%	3%	0%	0%
Marine Mammals				
Beluga whale	0%	0%	0%	0%
Seals	15%	0%	15%	15%
Birds and Eggs				
Ducks	28%	21%	9%	10%
Geese	18%	13%	5%	8%

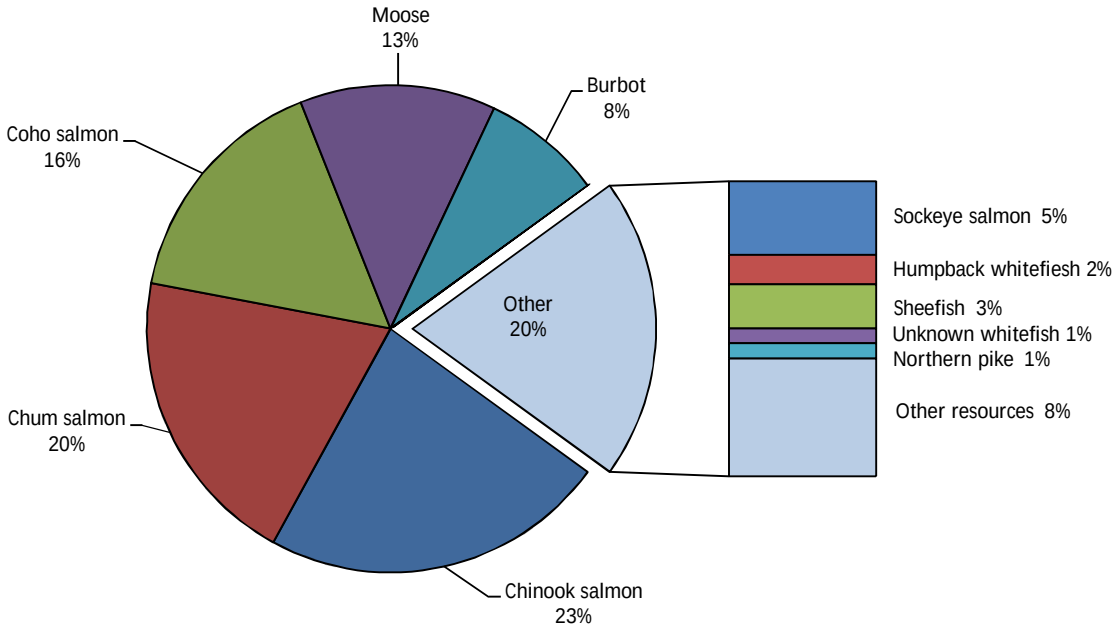
Table 3.21-7: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Aniak, 2009

	Percentage of Households, N* 170			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Upland Birds	38%	33%	8%	13%
Eggs	1%	1%	0%	1%
Vegetation				
Berries	65%	55%	21%	33%
Plants/greens/mushrooms	37%	37%	10%	10%
Wood	45%	39%	7%	12%

Notes:
*N = number of households in the community
Source: Brown et al. 2012

Both salmon and non-salmon species of fish made up the largest percentage (82 percent) of the Aniak subsistence harvest in 2009. Nine out of the top ten species harvested were: Chinook, chum, coho, and sockeye salmon; burbot; humpback whitefish; sheefish; unknown whitefish; and northern pike (Figure 3.21-19). Fishing for Chinook salmon usually peaks in the second and third weeks of June and ends in early July. Households that did not catch enough Chinook will usually target other species of salmon, but those other species have less oil content and dry differently. In addition, fishing later means that households run the risk of processing fish when flies are abundant, and rain is more likely (Brown et al. 2012). Chinook salmon are preferred over all other species of salmon for their size and oil content.

> *Basically, we're going after [Chinook] and then as bycatch we're catching reds [sockeye] and chum. We use some silvers [coho], but basically our number one priority is [Chinook]. Because of the oil content. They're bigger. You catch one and it's like catching five smaller fish. It is the premium fish, our choice* (quoted in Brown et al. 2012).



Source: Brown et al. 2012. Figure 3-1. Top 10 Species harvests ranked by estimated edible weight, Aniak, 2009.

Figure 3.21-19: Composition of Aniak Subsistence Harvests, 2009

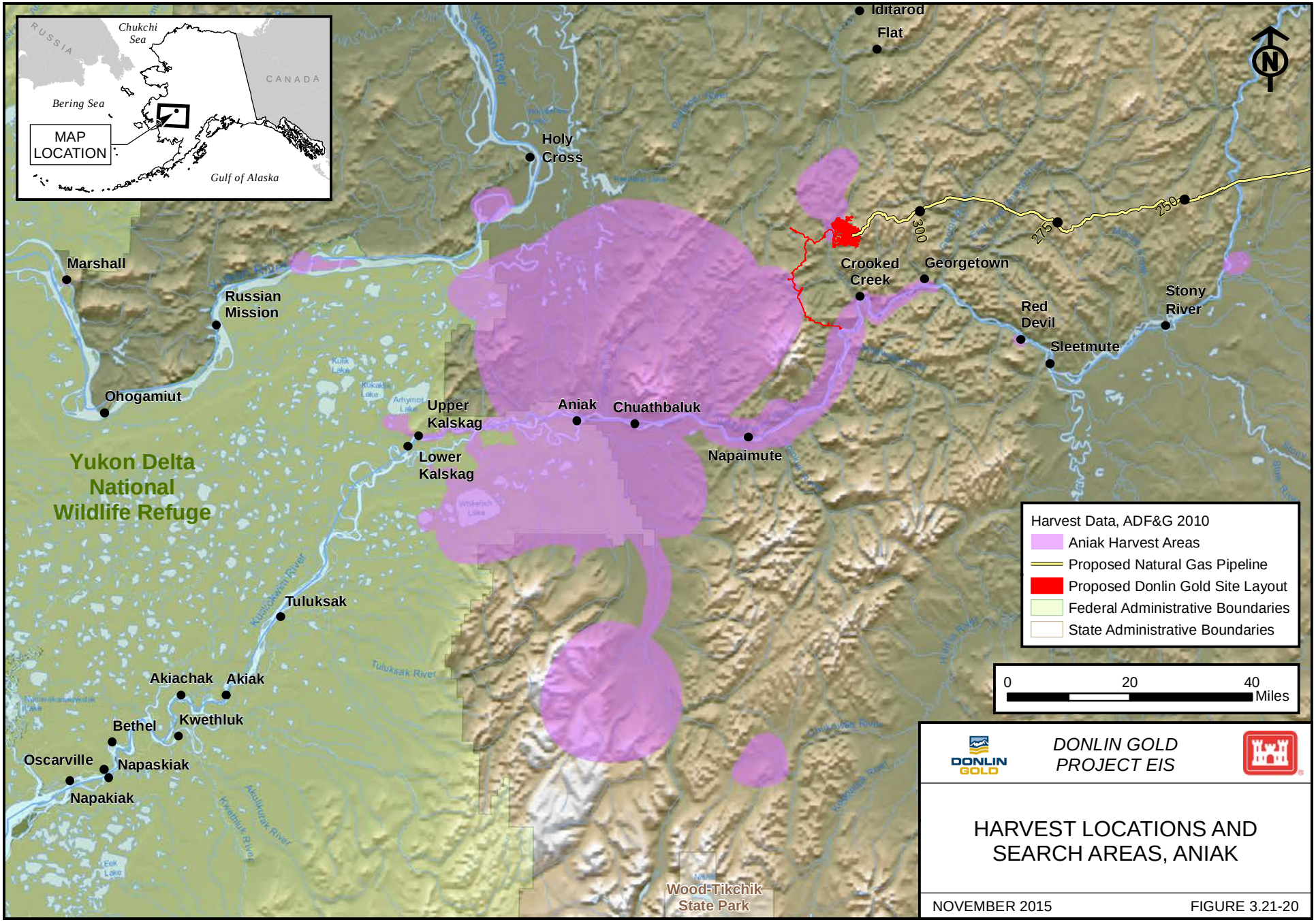
Land mammals, primarily moose and black bears, contributed 15 percent to the total harvest, while vegetation contributed another 2 percent and marine mammals, birds and eggs supplied less than one percent (Brown et al. 2012).

Harvest areas: In 2009, Aniak residents reporting using a harvest area of 3,396 square miles (Figure 3.21-20). The Kuskokwim and Aniak rivers figure prominently in subsistence activities both as harvest locations and transportation corridors. Households reported traveling a far up the Kuskokwim as the mouth of the George River. On the Aniak River, the community use area extended past the confluence of the Aniak, Salmon, and Kipchuk rivers. South and west of the community residents reported hunting and fishing in the vicinity of Whitefish Lake and the Buckstock Mountains.

Residents reported harvesting salmon in the mainstem of the Kuskokwim River east and west of the community, with additional areas along the Aniak River. Non-salmon fish species were harvested along the Aniak River and Whitefish Lake.

Aniak residents reported ranging over a wide area to hunt moose, caribou, and black bear. The extent of moose hunting may be a response to different game management strategies in different subunits of GMU 19. In GMU 19A, moose are managed more conservatively than in GMU 19B. People reported hunting moose to the north in GMUs 21A and 21E towards Paimiut Slough and the Iditarod River drainage (Brown et al. 2012).

Sharing: Sharing, measured in terms of households giving and receiving subsistence food, was highest for Chinook salmon and moose with large numbers of Aniak households reportedly receiving these resources (Table 3.21-7) (Brown et al. 2012).


Iditarod
Flat
Holy Cross
Marshall
Russian Mission
Ohogamiut
Yukon Delta National Wildlife Refuge
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napaimute
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
300
275
250
Tuluksak
Akiachak
Akiak
Bethel
Kwethluk
Oscarville
Napaskiak
Napakiak
Wood-Tikchik State Park
MAP LOCATION
Chukchi Sea
Bering Sea
Gulf of Alaska
RUSSIA
CANADA
Harvest Data, ADF&G 2010
Aniak Harvest Areas
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Federal Administrative Boundaries
State Administrative Boundaries
0
20
40
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
HARVEST LOCATIONS AND SEARCH AREAS, ANIAK
NOVEMBER 2015
FIGURE 3.21-20

Aniak residents said that traditional values still hold, including the respectful treatment of animals, avoiding waste, taking care of one's harvest, and sharing – particularly with those unable to harvest subsistence food themselves. The practice of giving away a young hunter's first harvest is still observed in some families (Brown et al. 2012). Figure 3.21-21 illustrates the flow of wild foods between households within Aniak and with numerous other communities in Alaska. In Aniak, the largest producing household, represented by the large red square in the middle of the figure, had both a female and male head.

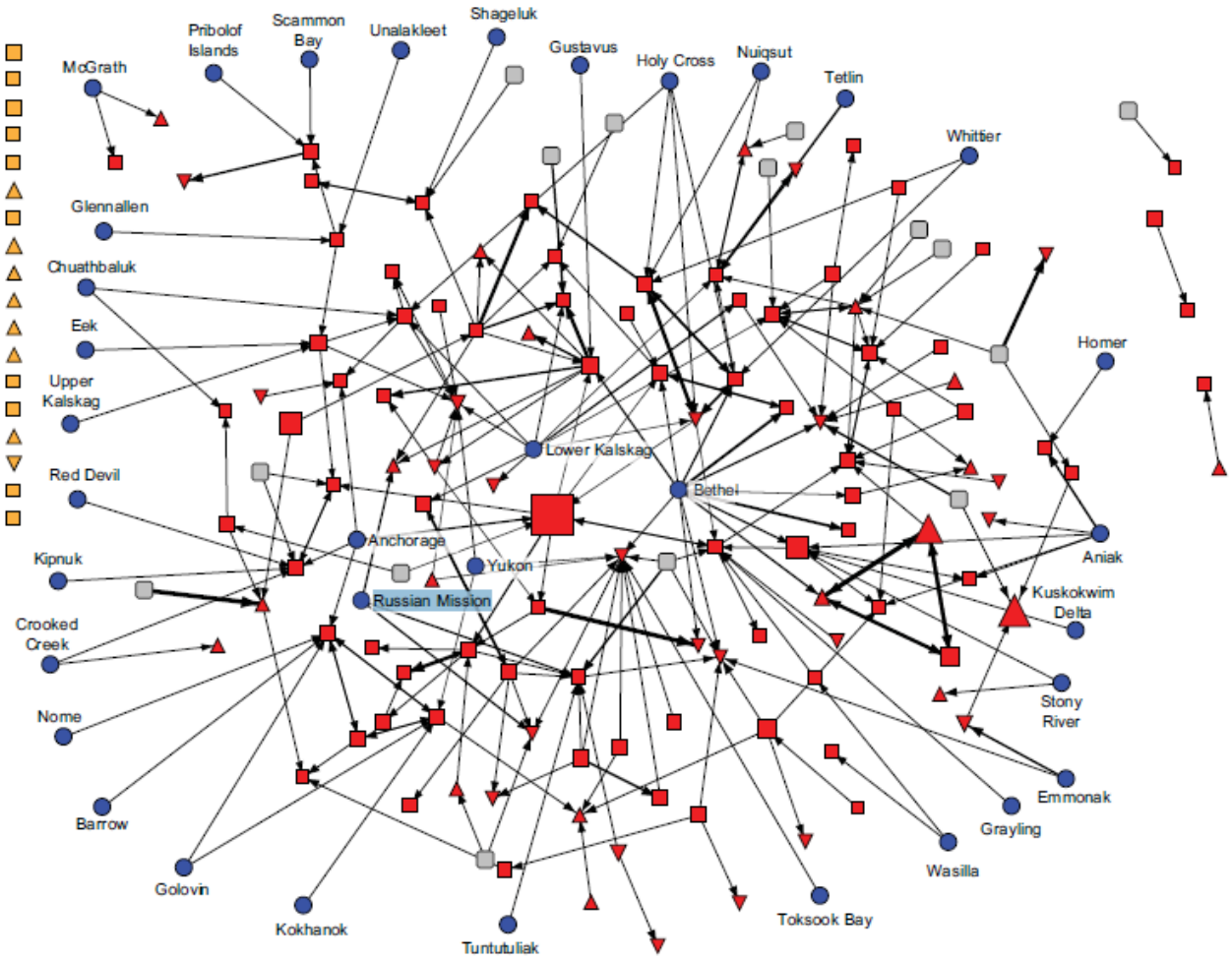
Concerns: For all resource categories most respondents said they got enough subsistence foods in 2009. However, over 50 percent of respondents reported not getting enough moose, caribou, or greens and berries. Most respondents cited resource availability as the reason for not getting enough of these resources (Brown et al. 2012).

Moose populations in the Central Kuskokwim have experienced heavy hunting pressure form locals, nonlocal Alaska residents, and nonresidents. Aniak residents generally agreed the moose population was rebounding but the large number of hunters in the fled makes it difficult to harvest a moose.

> *Every day in the whole world can come over here and hunt while we're trying to hunt. It makes it harder for us people who are living here, to go out in our own country to go find moose. Everywhere we go, there's camps where we hunt year round. Every fall time, we try to go hunting, in the areas we show you, there's camps. They go way back, they fly. One year, two years in a row, we didn't get moose. We got meat lower 48 people who came to hunt. Half the time we had to throw away the meat. It wasn't taken care of, it was spoiled* (quoted in Brown et al. 2012).

All residents who participated in the ADF&G survey in 2009 said that the size and abundance of Chinook salmon had decreased in recent decades. One resident said that since the 1960s both Chinook and chum salmon seemed to have declined (Brown et al. 2012).

> *The [Chinook], there are not as many and they are not as big right now compared to when I was a teenager. Big [Chinook], those were easy to get. At my dad's, our fish camp growing up, the smokehouse would fill up in 4 days and we'd be done with [Chinook] fishing. Now you have to fish from 2-3 weeks to get what you need* (quoted in Brown et al. 2012).



LEGEND

- Survey household, male & female heads[a]
- Survey household, single male head[a]
- Survey household, single female head[a]
- Other household in study community
- Unknown household (usually in another community)

- Flows of wild foods from source harvesting or processing households to consuming (surveyed) households, as reported by the surveyed households[b]
- Household that reported no harvesting or processing by members of another household or community

[a] SYMBOLS are scaled to show surveyed households' total wild food harvests in edible pounds. Surveyed households with many sources of wild foods appear near the center of the figure. Households with fewer sources appear around the edges.

[b] LINES are scaled to show the number of households named as wild food harvesters or processors by surveyed households. Arrows point from source households or communities to surveyed households. Households' own production is not shown.

Data Sources: ADF&G (2010)

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WILD FOOD HARVESTING AND PROCESSING NETWORK, ANIAK

NOVEMBER 2015 FIGURE 3.21-21

3.21.5.2.5 CHUATHBALUK

Chuathbaluk is located on the north bank of the Kuskokwim River, 11 miles upstream from Aniak and 87 air miles from Bethel. In 2009, the estimated population was 122 people. In 2010, researchers from the ADF&G surveyed 30 of the 36 households in Chuathbaluk. Expanding for the six unsurveyed households Chuathbaluk's estimated total harvest was 29,874 pounds with an average household harvest of 829 pounds. The average household income was $28,522 (Brown et al. 2012).

Species harvested and used: One hundred percent of Chuathbaluk households reported using a subsistence resource in 2009 and 93 percent reported harvesting a resource. Fish were the most widely used resource category (97 percent) followed by vegetation (87 percent), land mammals (80 percent), and birds and eggs (57 percent). The most widely harvested resources were vegetation, fish, birds and eggs, and land mammals respectively. Over 60 percent of the total harvest was composed of various species of salmon. The most widely used salmon species was Chinook, followed by sockeye, coho, and chum (Table 3.21-8).

Table 3.21-8: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Chuathbaluk, 2009

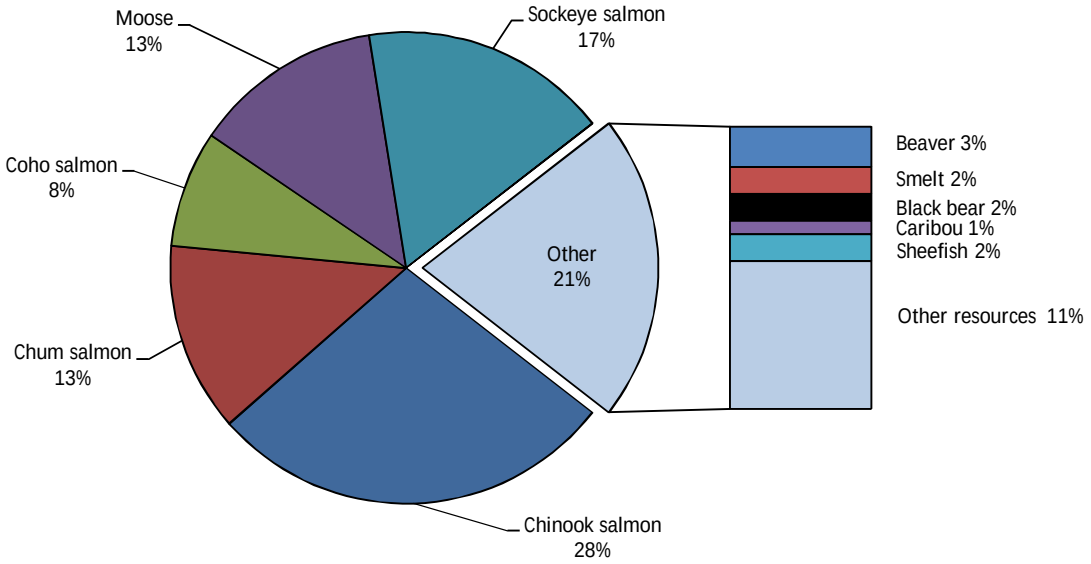
	Percentage of Households, N* 36			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	90%	60%	23%	47%
Chum	67%	57%	17%	27%
Coho	77%	60%	20%	43%
Sockeye	83%	60%	27%	40%
Pink	10%	0%	0%	10%
Non-Salmon				
Whitefish	70%	30%	13%	47%
Smelt	27%	7%	7%	20%
Land Mammals				
Black Bear	23%	7%	10%	17%
Caribou	27%	3%	3%	23%
Moose	77%	20%	23%	60%
Beaver	30%	20%	7%	17%
Hare	10%	3%	3%	7%
Muskrat	0%	0%	0%	0%
Marine Mammals				
Beluga whale	0%	0%	0%	0%
Seals	23%	0%	0%	23%
Birds and Eggs				
Ducks	40%	20%	7%	20%

Table 3.21-8: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Chuathbaluk, 2009

	Percentage of Households, N* 36			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Geese	33%	23%	7%	13%
Upland Birds	37%	33%	10%	3%
Eggs	3%	0%	0%	3%
Vegetation				
Berries	80%	63%	20%	33%
Plants/greens/mushrooms	53%	53%	20%	0%
Wood	67%	67%	7%	10%

Notes:
*N = number of households in the community
Source: Brown et al. 2012.

Moose made up 13 percent of the total harvest but was used by over 70 percent of households. Other resources harvested and used by the community included beaver, smelt, sheefish, black bear, and caribou (Figure 3.21-22). Residents reported that moose is a very important source of protein and provides some measure of economic relief since households that do not harvest or receive moose meat have to purchase meat for the winter (Brown et al. 2012). The next most important sources of meat are black bear and caribou, but caribou are relatively scarce; the community harvested only 4 animals in 2009.



Source: Brown et al. 2012. Figure 4-1. –Top 10 Species harvests ranked by estimated edible weight, Chuathbaluk, 2009.

Figure 3.21-22: Composition of Chuathbaluk Subsistence Harvests, 2009

Harvest areas: In 2009, Chuathbaluk residents reporting using a harvest area of 982 square miles (Figure 3.21-23). Land use as reported by residents in 2009 was confined primarily to the mainstems of the Kuskokwim, Aniak and Holokuk rivers, as well as Victoria and Suter creeks (Brown et al. 2012). Salmon search and harvest locations were limited to an area 5 miles upriver of the community to 6 below on the mainstem of the Kuskokwim River. Salmon were also harvested in the vicinity of Napaimute and in Aniak Slough. Whitefish, rainbow/steelhead trout harvest locations are very similar to those used for salmon.

Chuathbaluk residents said they ranged over a wide area to hunt moose, caribou, and black bear. Caribou were harvested in an area to the southwest of Aniak and east of Whitefish Lake. Black bear were hunted on the north and south banks of the Kuskokwim upriver of Napaimute. Moose were hunted along the river corridor of GMU 19A as well as in the Holokuk River drainage, the Russian Mountains, Suter Creek and the Kolamokof (Brown et al. 2012).

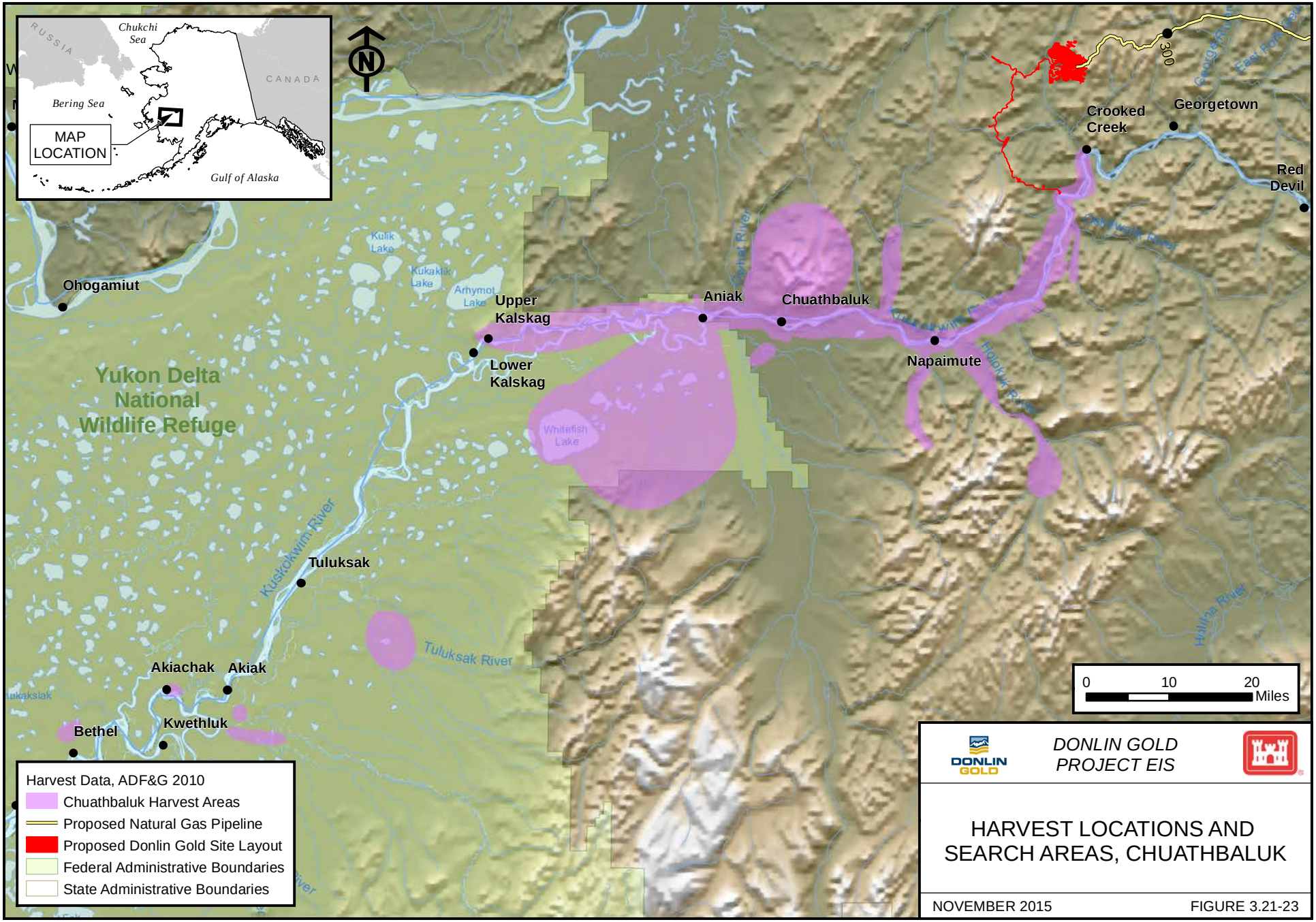
Sharing: As measured in terms of households giving and receiving subsistence food, sharing was highest for fish and land mammals. Almost 90 percent of Chuathbaluk households reported receiving wild foods while 60 percent reported giving away a resource (Brown et al. 2012). Figure 3.21-24 illustrates the flow of wild foods between households within Chuathbaluk or received from other communities within Alaska. The figure shows the distribution of subsistence foods from certain high harvesting households. In Chuathbaluk, the two highest food-producing households were a mature household composed of a man and wife with substantial income, and a single female-headed household (Brown et al. 2012).

Concerns: In 2009, a majority of respondents said they got enough subsistence resources with the exception of vegetation. Just over 60 percent of respondents said they did not get enough berries and several respondents said the effect on their households was either major or severe (Brown et al. 2012).

When asked about salmon abundance over time respondents gave various answers. One man summarized the view of many middle aged and elderly residents:

> *Fishing was good early in the 80s, 70s. Nobody was having a hard time; they could be catching fish right away. Fishing was great, all the way from the 70s to the 90s. Middle 90s we started to see a lot of changes. It is just getting harder and harder trying to live a subsistence lifestyle, but there are a lot of us that still do it* (quoted in Brown et al. 2012).

The most prominent change in the subsistence harvest over the past 30 years has been the decline in moose as a substantial component of the community's diet. Several residents said that moose populations have steadily declined since about the mid-1990s. Hunting effort and the distance traveled has also increased. Moose are now more elusive and avoid waterways used for hunting. Most residents agreed that predation from wolves and bears has been a growing factor since the 1990s. Black bear harvests have experienced a similar decline, though not as sharp as moose. Prior to the 1990s caribou was an important source of meat but since then caribou harvests have steadily declined.



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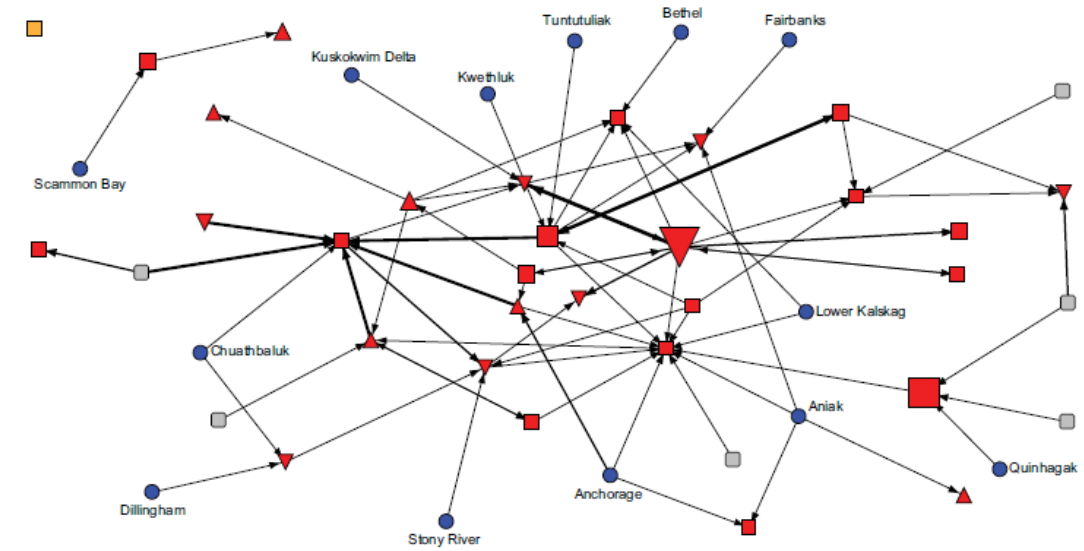
HARVEST LOCATIONS AND SEARCH AREAS, CHUATHBALUK

NOVEMBER 2015

FIGURE 3.21-23



LEGEND

- Survey household, male & female heads[a]
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[a] SYMBOLS are scaled to show surveyed households' total wild food harvests in edible pounds. Surveyed households with many sources of wild foods appear near the center of the figure. Households with fewer sources appear around the edges.

[b] LINES are scaled to show the number of households named as wild food harvesters or processors by surveyed households. Arrows point from source households or communities to surveyed households. Households' own production is not shown.

Data Sources: ADF&G (2010)

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DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK, CHUATHBALUK

NOVEMBER 2015 FIGURE 3.21-24

3.21.5.3 SUBSISTENCE HARVEST PATTERNS: LOWER-MIDDLE KUSKOKWIM SUBREGION

The lower-middle Kuskokwim subregion includes the communities of Tuluksak, Akiak, Akiachak, Kwethluk, Oscarville, Napaskiak, Napakiak, Atmautluak, Kasigluk, Nunapitchuk, and Bethel, the regional center. The current population of these communities is 10,807. In 2011, ADF&G Division of Subsistence undertook harvest surveys in Oscarville, Kwethluk, Akiak, and Tuluksak. This research was Phase II in the Donlin Gold Subsistence Research Program. Research in Bethel took place in 2013 when the Division of Subsistence conducted a household survey to collect data for the 2012 study year. The Bethel results have not been published in a Technical Report, so incomplete information is currently available. No data on the subsistence practices of Atmautluak and Kasigluk are available. Bethel and Kwethluk are highlighted communities for this subregion.

Residents of the lower-middle Kuskokwim River region described a long tradition of engaging in subsistence activities and many said that access to subsistence resources was essential to maintaining their cultural heritage, family, and community ties. The current harvest patterns of Oscarville, Kwethluk, Akiak, and Tuluksak largely reflect historical patterns of the lower-middle Kuskokwim region typified by a diverse resource base with heavy reliance on fish and land mammals supplemented by harvests of marine mammals, migratory birds and eggs, and a wide variety of plants. For the year 2010, residents of the four lower Kuskokwim communities harvested and estimated total of 693,542 edible pounds of subsistence resources, or 429 pounds per capita (Brown et al. 2013). Salmon and freshwater fish species provided 70 percent of the total regional subsistence harvest. Moose contributed 7 percent of the total, caribou 4 percent, while berries, plants, and various species of small game provided the other 19 percent. Per capita harvests range from 168 pounds in Bethel to 1,328 pounds in Akiachak (Table 3.21-9).

Table 3.21-9: Lower-Middle Kuskokwim Subregion Per Capita Harvests

Community	Bethel**	Tuluksak	Akiak	Akiachak	Kwethluk**	Nunapitchuk	Oscarville	Napakiak	Napaskiak
Reference Year	**2012**	**2010**	**2010**	**1998**	**2010**	**1983**	**2010**	**2011**	**2011**
Population of community	6,113	455	386	523	713	457	63	316	480
Number of households	1,645	86	89	118	155	70	14	89	96
All Resources in pounds	168	359.34	615.66	1,328.28	364.06	801.91	520.57	493.52	409.92
Marine Mammal	3.22	0.00	5.67	30.70	24.88	19.68	14	9.25	29.01
Seal	2.17	2.88	1.64	18.72	17.40	19.68	14.00	9.25	13.3
Sea Otter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Walrus	1.04	3.06	4.03	9.19	5.14	0.00	0.00	0.00	0.00
Whale	0.00	0.00	0.00	2.79	2.34	0.00	0.00	0.00	0.00
Large Land Mammal	43.34	34.40	57.25	244.53	47.91	21.17	41.66	50.07	61.14
Bison	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Black Bear	0.37	1.67	1.10	10.45	1.17	2.25	0.00	0.00	0.00
Brown Bear	0.17	0.39	0.00	2.79	1.32	0.00	0.00	0.00	0.00
Caribou	8.57	8.35	18.57	85.91	20.19	0.00	21.66	19.84	17.73
Dall Sheep	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Moose	33.93	24.00	37.58	145.39	25.23	18.92	20	28.74	43.41
Muskox	0.18	0.00	0.00	0.00	0.00	0.00	0.00	1.48	0.00
Small land Mammal	1.09	6.99	9.94	26.35	7.97	29.70	0.11	0.00	0.80
Beaver	0.65	3.93	6.15	12.41	6.48	20.68	0.00	2.19	0.589
Coyote	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fox	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3.21-9: Lower-Middle Kuskokwim Subregion Per Capita Harvests

Community	Bethel**	Tuluksak	Akiak	Akiachak	Kwethluk**	Nunapitchuk	Oscarville	Napakiak	Napaskiak
Reference Year	**2012**	**2010**	**2010**	**1998**	**2010**	**1983**	**2010**	**2011**	**2011**
Hare	0.40	2.52	3.39	11.09	0.80	2.76	0.00	3.32	0.164
Land Otter	0.00	0.13	0.00	0.47	0.08	0.28	0.11	0.03	0.0214
Lynx	0.00	0.11	0.03	0.02	0.07	0.00	0.00	0.00	0.00
Marmot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marten	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mink	0.00	0.02	0.00	0.06	0.00	5.97	0.00	0.00	0.00
Muskrat	0.01	0.01	0.10	0.30	0.18	0.14	0.00	0.00	0.00
Porcupine	0.02	0.21	0.26	1.96	0.36	0.00	0.00	0.02	0.028
Squirrel	0.00	0.06	0.00	0.04	0.00	0.00	0.00	0.00	0.00
Weasel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wolf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fish	102.10	260.47	500.67	897.39	254.61	653.38	425.21	385.36	279.4
Salmon	68.75	173.03	291.98	649.15	170.35	288.01	256.00	232.24	174.54
Non-Salmon	33.34	87.45	208.69	248.24	84.26	365.38	169.20	153.12	104.86
Marine Invertebrate	0.14	0.00	0.16	0.00	0.00	0.00	0.00	0.05	0.00
Bird and egg	9.66	20.88	20.8	68.5	12.75	33.64	18.12	24.6	23.55
Crane	0.00	0.49	0.43	6.97	0.42	2.51	1.55	2.96	1.888
Duck	1.48	6.26	6.84	0.19	3.42	13.95	6.31	6.02	7.48
Geese	4.13	6.12	5.35	15.23	5.82	9.85	6.58	5.41	8.99
Seabird and loon	0.00	0.24	0.07	1.48	0.07	0.00	0.00	0.00	0.00
Shorebird	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3.21-9: Lower-Middle Kuskokwim Subregion Per Capita Harvests

Community	Bethel**	Tuluksak	Akiak	Akiachak	Kwethluk**	Nunapitchuk	Oscarville	Napakiak	Napaskiak
Reference Year	**2012**	**2010**	**2010**	**1998**	**2010**	**1983**	**2010**	**2011**	**2011**
Swan	0.75	5.14	6.01	15.35	1.60	1.82	0.92	2.56	1.214
Upland Game Birds	2.67	2.27	2.05	10.70	1.17	5.20	2.05	5.71	3.28
Birds Eggs	0.22	0.60	0.00	1.16	0.26	0.32	0.68	1.97	0.73
Vegetation	8.68	30.64	21.22	60.82	15.94	44.19	21.45	18.61	15.99

Notes:
**Representative communities

Source: Brown et al. 2013; ADF&G 2015d.

3.21.5.3.1 BETHEL

Bethel lies on the northwest bank of the Kuskokwim River, 400 air miles from Anchorage. In 2012, Bethel had a population of 6,113 people. It is the central service hub for the Yukon-Kuskokwim Delta, serving 56 remote villages with a regional population of 26,000 people. For this reason, Bethel is profiled in the EIS. In 2012, the average per capita harvest was 168 pounds of wild food or 580 pounds per household. Between 2007 and 2011, the average annual per capita income was $29,261 (Fall e2013).

In 2013, researchers from ADF&G surveyed 466 of 1,645 households in Bethel. This was the first comprehensive household survey conducted in Bethel, and unlike the other surveys cited in this EIS, the research was not funded by Donlin Gold. Information on Bethel subsistence did not previously include a seasonal round or data on a wild food harvesting and processing network.[4] As of July 2015, full results on Bethel subsistence harvests have not been published. The information presented here comes from published data presented to the Joint Boards of Fish and Game in October 2013 (Fall 2013).

Species harvested and used: In 2012, Bethel households used 15 kinds of wild resources, and harvested 8 different kinds. Over 90 percent of Bethel households used wild resources while 85 percent harvested resources. Resources used by most households included berries, moose, Chinook salmon, coho salmon, sockeye salmon, caribou, and chum salmon (Table 3.21-10). Over 50 percent of households fished for salmon and non-salmon fish species, while 30 percent harvested land mammals, 43 percent harvested birds and eggs, and 77 percent harvest vegetation such as berries or greens (Fall 2013).

Table 3.21-10: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Bethel, 2012

	Percentage of Households			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	61%	37%	20%	33%
Chum	54%	36%	20%	23%
Coho	60%	35%	21%	29%
Sockeye	59%	38%	23%	28%
Pink	8%	6%	1%	2%
Non-Salmon				
Whitefish	52%	13%	9%	18%
Smelt	44%	33%	19%	15%
Land Mammals				

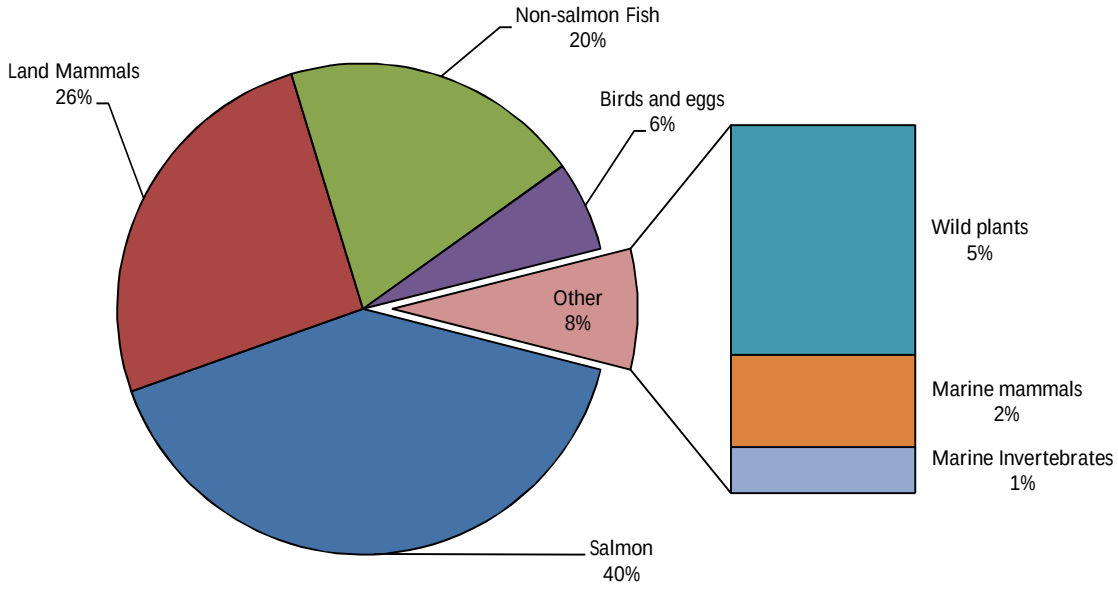
[4] In 2012, ADF&G conducted a survey asking a sample of households about harvest of land mammals for the harvest year 2011 (Runfola et al. 2014). Since the 2013 study (Fall 2013) is more recent and more comprehensive, it is the basis for the description in this section.

Table 3.21-10: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Bethel, 2012

	Percentage of Households			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Black Bear	3%	1%	1%	2%
Caribou	55%	13%	15%	45%
Moose	74%	19%	27%	60%
Beaver	9%	6%	3%	3%
Hare	14%	10%	4%	4%
Muskrat	2%	2%	1%	0%
Marine Mammals				
Beluga whale	13%	0%	1%	13%
Seals	42%	4%	11%	41%
Birds and Eggs				
Ducks	38%	23%	12%	19%
Geese	48%	28%	17%	28%
Upland Birds	42%	29%	18%	16%
Eggs	19%	7%	4%	13%
Vegetation				
Berries	80%	71%	25%	27%
Plants/greens/mushrooms	45%	38%	15%	21%
Wood	28%	25%	4%	5%

Source: ADF&G 2015d.

Salmon made up 40 percent of the total harvest while 26 percent was composed of land mammals, 20 percent non-salmon fish species, 6 percent birds and eggs, 5 percent wild plants, 2 percent marine mammals, and less than 1 percent marine invertebrates (Figure 3.21-25). Chinook salmon in the Kuskokwim River were unusually low in 2012 due to regulatory closures caused by poor returns so that data on total harvests collected in 2012 may not be representative compared to years where there were no restrictions.



Source: ADF&G 2015d.

Figure 3.21-25: Composition of Bethel Subsistence Harvests, 2012

Harvest areas: Data collected from harvest tickets and permits show that over the most recent 5-year period, Bethel residents primarily hunted in GMU 18 for moose, caribou, and muskoxen. Moose were also hunted in GMUs 19, 20, and 21. Most subsistence salmon fishing takes place in the Kuskokwim River. There are no maps of Bethel residents' subsistence use areas available at present.

Sharing: In 2012, 92 percent of Bethel households received gifts of wild resources, and 70 percent gave resources away. On average, Bethel households received 7.3 kinds of wild foods and gave away 4.2 different kinds (Fall 2013). Bethel residents also share food with other Kuskokwim communities as documented in a recent study of wild food harvesting and processing networks in central Kuskokwim communities (Brown et al. 2012). There is no figure regarding sharing patterns among Bethel residents currently available.

Concerns: In 2013, Bethel residents provided their views on the importance of subsistence resources for their community and way of life. One resident referred to the economic importance of subsistence foods as,

> *"We have to count on our subsistence resources... Because of the cost of existing out here, you depend on the fish, and the birds, and the berries and the greens and the big game"* (quoted in Fall 2013).

Several others talked about the spiritual aspects of subsistence:

> *[Subsistence is] wholeness... mind, body, sprit...You are what you eat* (quoted in Fall 2013).

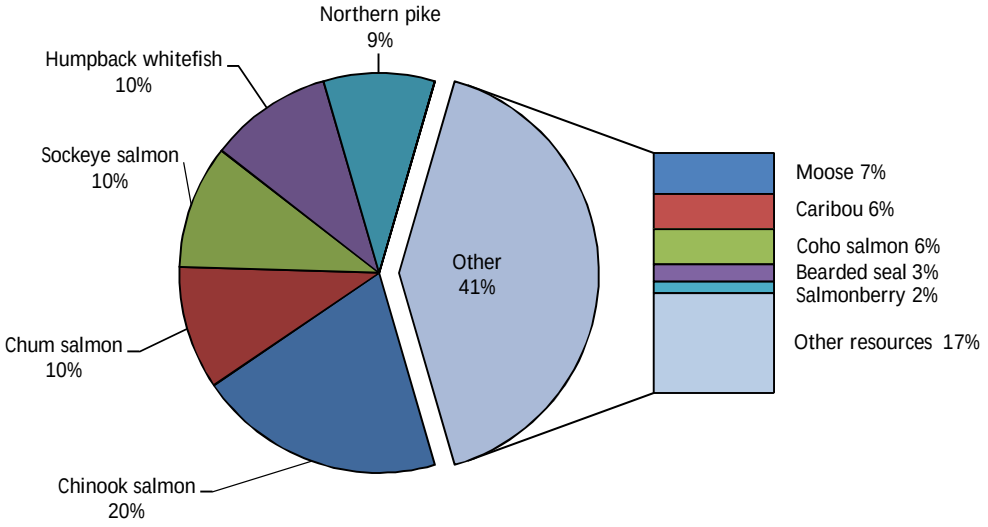
> *You know there are people in Bethel who genuinely need subsistence fish. That part of their spiritual, part of their cultural upbringing are genuinely attached to it* (quoted in Fall 2013).
>
> *[What subsistence means] is health, community... like a loose way to find spirituality... staying active, and then the nutrition that all the wild foods provide* (quoted in Fall 2013).
>
> *It [subsistence] means the connection to the ancestry... It makes them feel good to be able to work on the animals and eat the animals and berries and whatever, just like their ancestors did* (quoted in Fall 2013).

3.21.5.3.2 KWETHLUK

Kwethluk is a Yup'ik community located 12 air miles east of Bethel on the Kwethluk River at the junction with the Kuskokwim Slough off the Kuskokwim River. It is the second largest community along the Lower Kuskokwim River. The community is strategically located on the lower Kuskokwim River and has experienced rapid, but sporadic population growth since the 19th century. In 2010, Kwethluk had a population of 751.

In April of 2011, researchers surveyed 93 of 155 households regarding harvests in 2010. Expanding for the 62 unsurveyed households, Kwethluk households reported a harvest of 259,699 pounds of wild food or an average per household harvest of 1,676 pounds (Brown et al. 2013). Household incomes in Kwethluk averaged $34,250 (Brown et al. 2013).

Species Harvested and Used: In 2010, Chinook, chum, and sockeye salmon; humpback whitefish; and northern pike composed 59 percent of the total Kwethluk subsistence harvest (Figure 3.21-26). The remaining 41 percent was comprised of large land mammals, other fish species, marine mammals, various edible plants, birds and eggs, and marine invertebrates. Chinook salmon made up 42 percent of the total salmon harvest. Sockeye salmon were the next most frequently harvested (22 percent), followed by chum, and coho salmon. While the subsistence fishery is focused on Chinook salmon, some residents noted that elders preferred chum salmon, which are not as rich (Brown et al. 2013). Humpback whitefish made up 42 percent of the non-salmon fish species harvest. Kwethluk residents also reported harvesting smelt, burbot, sheefish, broad whitefish, and northern pike. Some salmon for home use are also taken out of commercial fish harvests (Brown et al. 2013).



Source: Brown et al. 2013. Figure 6-1. Top 10 Species harvests ranked by estimated edible weight, Kwethluk, 2010.

Figure 3.21-26: Composition of Kwethluk Subsistence Harvest, 2010

By resource category, the most widely used resources were fish and land mammals (each used by 98 percent of households), vegetation (95 percent), birds and eggs (91 percent), and marine mammals (62 percent). The most widely harvested resource categories were vegetation, fish, birds and eggs, and land mammals. Referring to subsistence resource species, Chinook salmon were most widely used (95 percent of households), while whitefish, caribou, moose, ducks, and berries were used by 80 – 88 percent of households.

Together moose and caribou composed 13 percent of the total harvest but were used by 84 percent and 87 percent of households respectively (Table 3.21-11).

Table 3.21-11: Percentage of Households Using, Harvesting, Giving, and Receiving Subsistence Resources by Category, Kwethluk, 2010

	Percentage of households, N* 155			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	95%	66%	43%	51%
Chum	72%	52%	34%	35%
Coho	57%	41%	24%	30%
Sockeye	67%	49%	31%	28%
Pink	13%	11%	2%	5%
Unknown salmon	10%	0%	0%	10%
Non-Salmon fish				
Whitefish	80%	53%	19%	45%

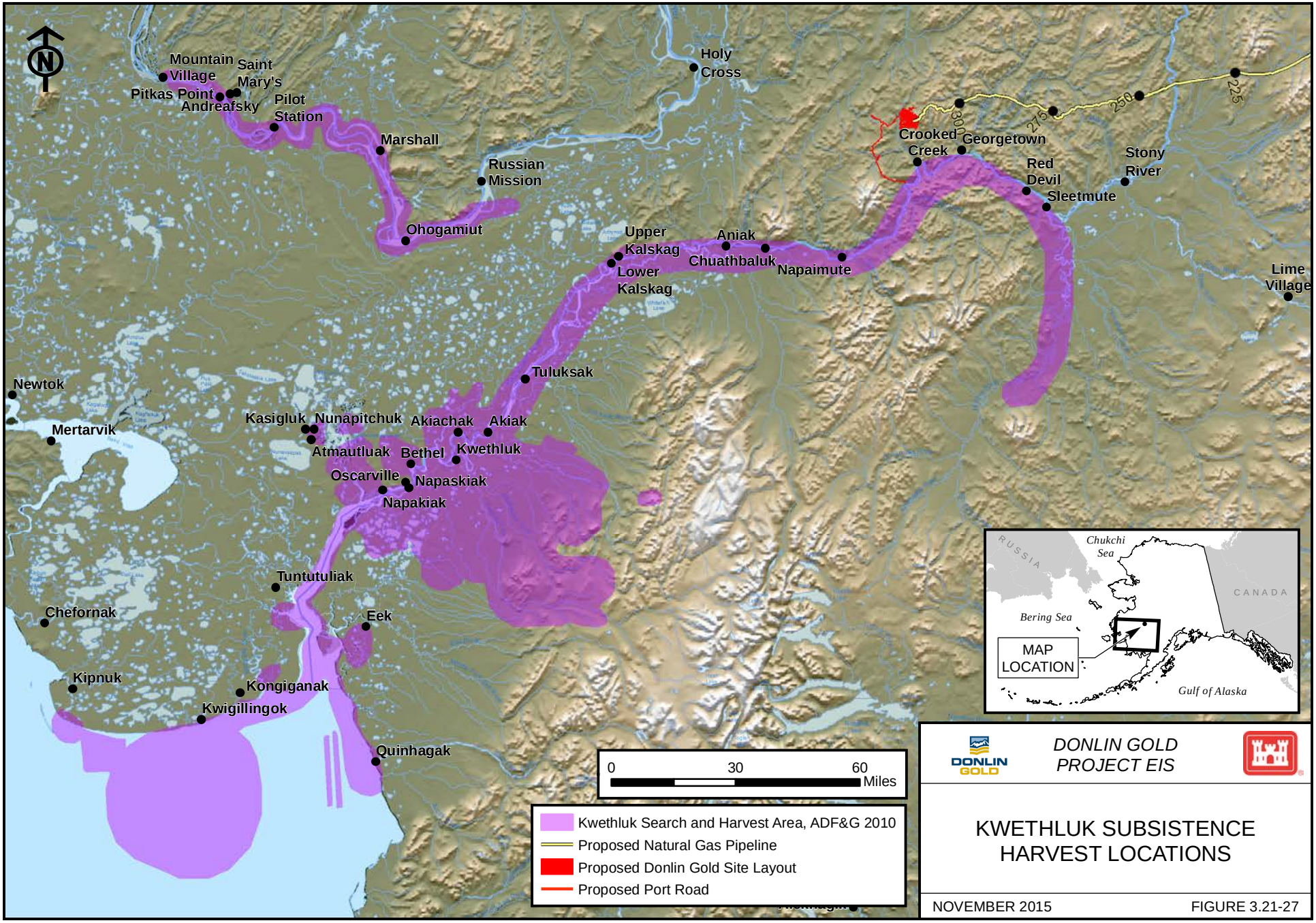
Table 3.21-11: Percentage of Households Using, Harvesting, Giving, and Receiving Subsistence Resources by Category, Kwethluk, 2010

	Percentage of households, N* 155			
	Using	**Harvesting**	**Giving away**	**Receiving**
Sheefish	26%	16%	8%	12%
Smelt	25%	17%	5%	9%
Land Mammals				
Black Bear	16%	5%	6%	12%
Caribou	87%	39%	32%	65%
Moose	84%	22%	22%	67%
Beaver	48%	32%	14%	25%
Hare	26%	17%	9%	10%
Muskrat	12%	8%	5%	6%
Marine Mammal				
Seals	60%	13%	13%	52%
Birds				
Ducks	84%	58%	35%	37%
Geese	78%	56%	28%	37%
Upland Birds	28%	23%	12%	8%
Eggs	17%	9%	6%	11%
Vegetation				
Berries	88%	83%	37%	32%
Plants/greens/mushrooms	70%	63%	22%	22%
Wood	66%	57%	12%	15%

Notes:
*N = number of households in the community
Source: Brown et al. 2013.

The importance of subsistence in Kwethluk is reflected in the high harvest and use levels; every household in Kwethluk used a subsistence resource and 97 percent of households harvested at least one resource. The most widely harvested resource was edible plants. Berries, especially salmon berries, made up 90 percent of the vegetation harvest (an estimated 1,160 gallons). Other edible plants harvested included greens, mushrooms, wild rhubarb, cow parsnip, and fiddlehead ferns (Brown et al. 2013).

Harvest Areas: In 2010, Kwethluk residents reported using a total of 6,379 square miles for subsistence, representing diverse marine, tundra, and boreal forest environments (Figure 3.21-27). Kwethluk hunters ranged further for large land mammals than any other resource. Moose hunters traveled up the Kisaralik, Akulikutak, and Kwethluk river drainages for a 10-day registration hunt in September. Some hunters also traveled up the Kuskokwim into GMU 19A and the Lower Yukon River to hunt for moose in December.



DONLIN GOLD

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KWETHLUK SUBSISTENCE HARVEST LOCATIONS

NOVEMBER 2015

FIGURE 3.21-27

While Kwethluk residents traveled widely to harvest subsistence resources, the area that experienced the most concentrated use was a 40-mile radius of land southeast of the community encompassing the Kisaralik, Akulikutak, and Kwethluk tributaries of the Kuskokwim River. Access was by boat and then over land on foot or snowmachine in the winter (Brown et al. 2013). Salmon fishing and the harvest of non-salmon fish species was concentrated along the Kuskokwim Slough and the Kwethluk and Kuskokwim rivers, but families also reported harvesting salmon near the communities of Napaskiak, Tuntutuliak, and Quinhagak (Figure 3.21-28).

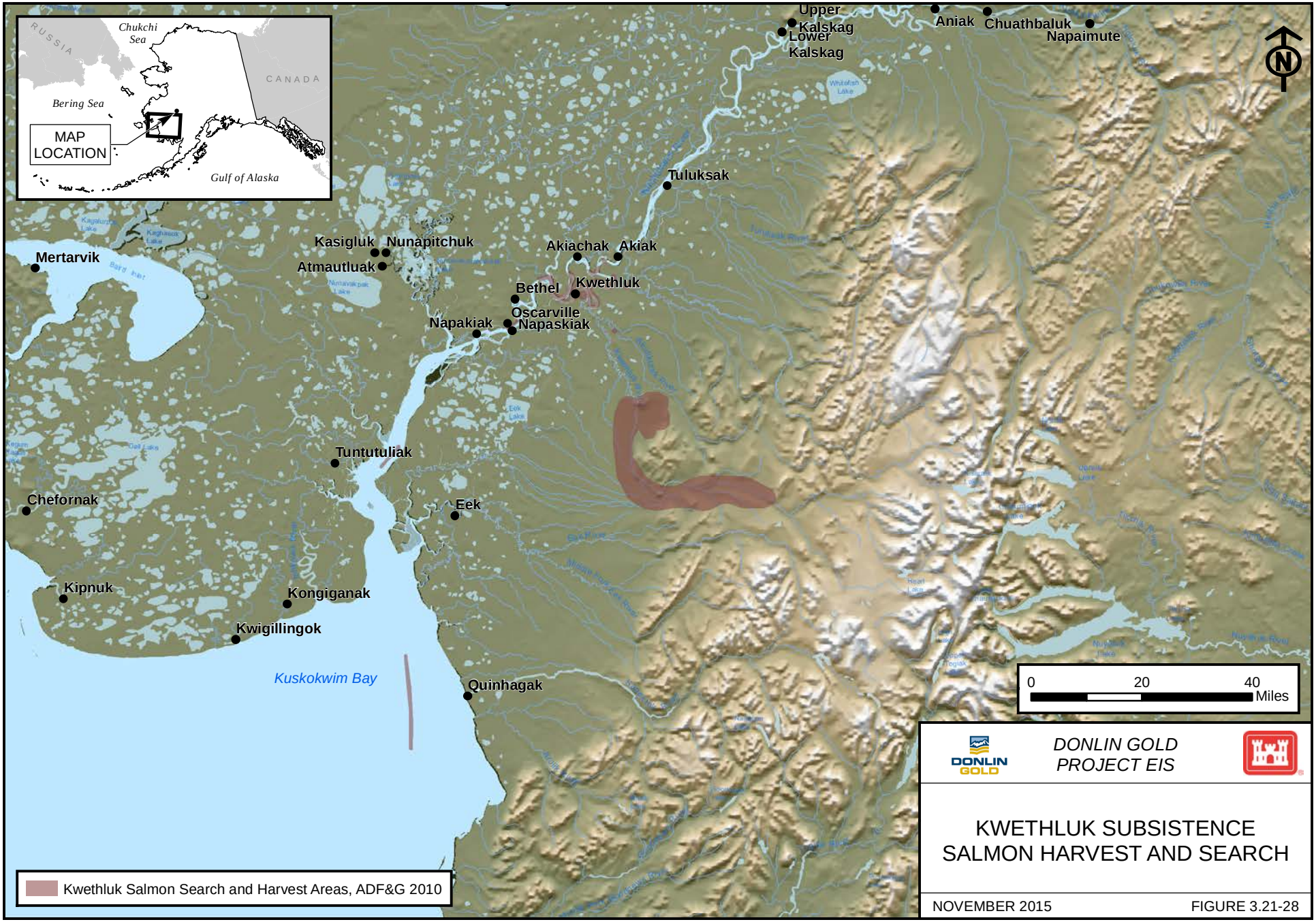
Sharing: As in most rural communities, certain households specialized in the harvest of wild foods; in Kwethluk 27 percent of the households harvested 70 percent of the wild foods. As in other rural communities the highest harvesting households conformed to a certain pattern; in Kwethluk the highest harvesting household was headed by a single male, who reported harvesting 11,514 pounds of wild food, while the second highest harvesting household was composed of a mature couple in their late 50s who reported a harvest of 11,396 pounds of wild food (Brown et al. 2013). The food harvested by this relatively small number of households was redistributed through sharing networks based on kinship or other social relationships (Figure 3.21-29).

Variability: For all resource categories, a majority of households in Kwethluk said they got enough subsistence resources in 2010 (Brown et al. 2013). When comparing use of wild resources against previous years, more than half the households said they used less salmon. Of households reporting less use of salmon, 21 percent said it was because of low abundance and another 20 percent said poor weather or changes in the environment prevented them from meeting their needs. Forty-five percent of households said they did not get enough salmon, particularly Chinook salmon; this despite the fact that the 2010 harvest of 5,458 fish was just below the 10-year average (2000 and 2010) of 5,892 fish (Brown et al. 2013).

Even though Kwethluk fishers exceeded their average in 2010, change in salmon abundance and harvest effort was a consistent theme among Kwethluk fishers. Ten years was not considered an adequate time period in which to measure population trends; and entire lifetime was the generally preferred frame of reference. The consensus was that over their lifetime annual variations in salmon populations had occurred though abundance has generally declined. One point about variability in salmon harvests: while Chinook runs have declined over time the harvest data shows a greater variation in harvest among salmon that come later in the year. This is because people concentrate their harvest at the beginning of the season when the Chinook run (Brown et al. 2013).

According to most Kwethluk households they used about the same amount of land mammals and marine mammals as in previous years and majorities in both cases said they got enough of those resources. Those households reporting that they did not get enough land mammals gave various reasons but the most frequent was the high price of gasoline; many also mentioned competition in the area and the short hunting season. The primary reason given by households for not getting enough marine mammals was because they did not receive enough from other harvesters (Brown et al. 2013).

Kwethluk's estimated moose harvest in 2010 was 33 moose, equal to the number of moose reported harvested in 1986. This does not mean that the moose population or hunting efforts have been steady. In 2010, Kwethluk residents agreed that moose numbers were increasing (in GMU 18) so their concerns were with restrictions, particularly the length of the season.



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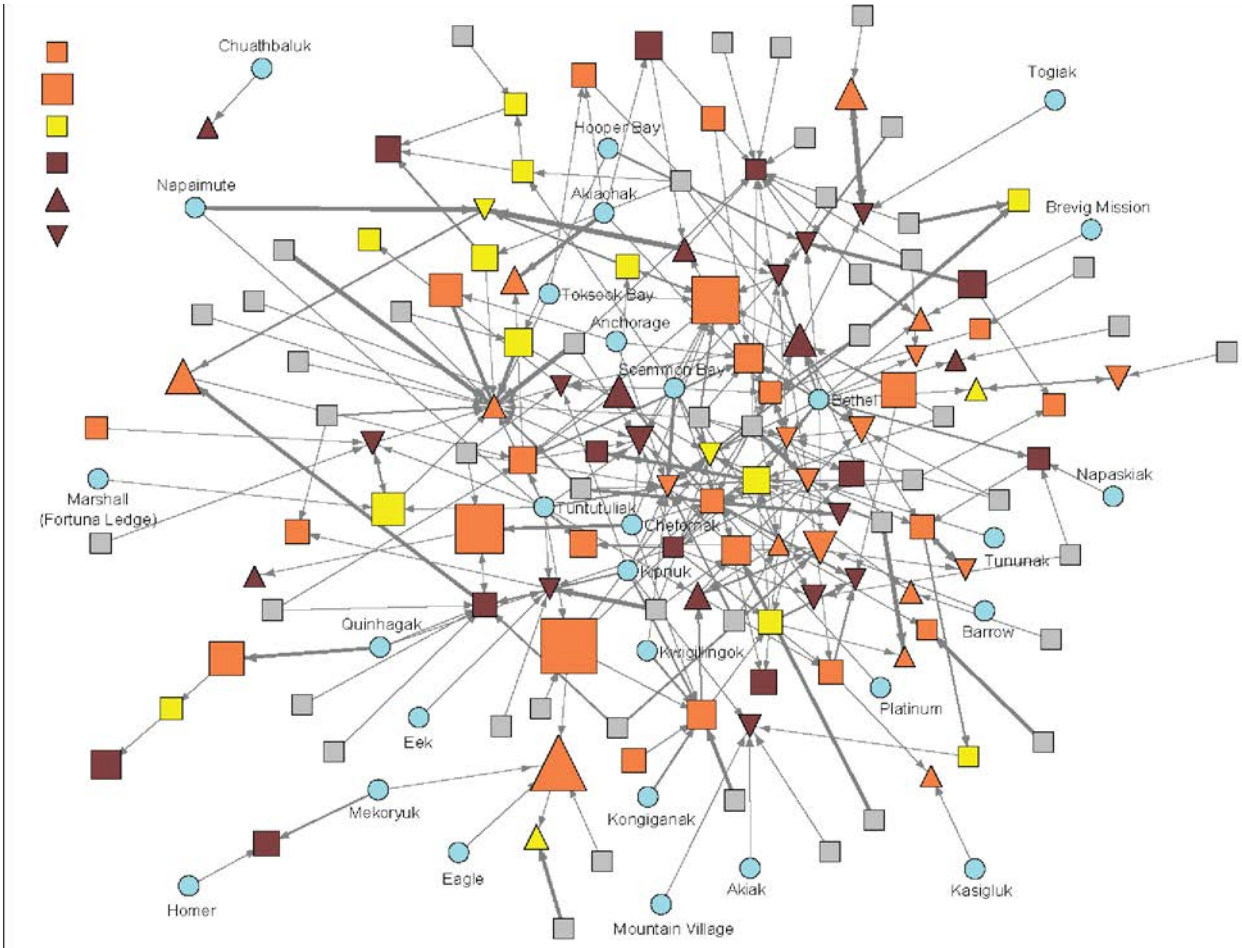
KWETHLUK SUBSISTENCE SALMON HARVEST AND SEARCH

NOVEMBER 2015

FIGURE 3.21-28



LEGEND

	Age of household head (years)			
	< 40	40 to 59	> 59	Unknown
Couple head	□	□	■	□
Single female head	▽	▽	▼	▽
Single male head	△	△	▲	△

SYMBOLS are scaled by households' total subsistence harvests (in edible pounds). Surveyed households with many sources of goods and services appear near the **center of the figure. Households with fewer sources appear around the edges.**

Flows of wild foods from source harvesting and processing households to consuming households, as reported by consuming (surveyed) households

Household not surveyed

Household in another community

LINES are scaled by the number of resources harvested and processed by other households for surveyed households. Arrows point from source households to surveyed households. A household's production for itself is not shown.

Data Sources: Brown et al. (2013)

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WILD FOOD HARVESTING AND PROCESSING NETWORK KWETHLUK, 2010

NOVEMBER 2015 FIGURE 3.21-29

Almost 60 percent of Kwethluk households said they get enough non-salmon fish species, but just about half of the households said they used less than in previous years. Reasons given for getting few non-salmon fish species included not having the equipment or they did not receive fish as usual. Compared to 1986, when the last harvest survey was done, harvests of certain non-salmon fish species have declined drastically, while others have remained steady. Northern pike harvests have declined from 40,694 pounds in 1986 to 24,125 pounds in 2010. Likewise burbot harvests have declined from 33,735 pounds to 1,938 pounds. Whitefish harvests, on the other hand, seem to be stable at about 30,000 pounds. While Arctic grayling, trout, and other non-salmon species are harvested in far fewer numbers they have considerable cultural importance (Brown et al. 2013).

3.21.5.4 SUBSISTENCE HARVEST PATTERNS: LOWER KUSKOKWIM SUBREGION

Communities included in the lower Kuskokwim subregion include Tuntutuliak, Eek, Kongiganak, Kwigillingok, Quinhagak, Goodnews Bay, and Platinum. The communities of Quinhagak, Goodnews Bay, and Platinum are included within this subregion although they are located in Kuskokwim Bay. The current population of these communities is 2,599. Subsistence harvest data for this subregion is highly variable. Quinhagak is the only community with a comprehensive harvest survey. The Division of Subsistence has conducted harvest surveys in a few communities such as Eek and Tuntutuliak, but these are limited to recording the harvest of non-salmon fish species and brown bear. No subsistence harvest data are available for the communities of Kongiganak, Kwigillingok, Goodnews Bay, and Platinum.

For this reason, Quinhagak was chosen as the representative community for this subregion. In 1982, researchers surveyed households in four Yup'ik communities in southwestern Alaska, including Quinhagak (Wolfe et al. 1984) regarding their subsistence harvest practices. Data was collected through participant observation and interviews with knowledgeable elders. Table 3.21-12 provides information on per capita harvests in the three communities for which there is subsistence harvest data.

Table 3.21-12: Lower Kuskokwim Subregion Per Capita Harvests

Community	Tuntutuliak*	Eek*	Quinhagak**[1]
Reference Year	**2005**	**2005**	**1982**
Population of community	402	284	98
Number of households	81	80	473
All Resources	1266.20	550.40	767.92
Marine Mammal	0.00	0.00	124.48
Seal	0.00	0.00	70.00
Sea Otter	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	4.83
Walrus	0.00	0.00	49.66
Whale	0.00	0.00	0.00-
Large Land Mammal	0.00	0.00	103.45

Table 3.21-12: Lower Kuskokwim Subregion Per Capita Harvests

Community	Tuntutuliak*	Eek*	Quinhagak**[1]
Reference Year	**2005**	**2005**	**1982**
Bison	0.00	0.00	0.00
Black Bear	0.00	0.00	0.00
Brown Bear	0.00	0.00	10.34
Caribou	0.00	0.00	62.07
Dall Sheep	0.00	0.00	0.00
Goat	0.00	0.00	0.00
Moose	0.00	0.00	31.03
Muskox	0.00	0.00	0.00
Small Land Mammal	0.00	0.00	14.46
Beaver	0.00	0.00	11.73
Coyote	0.00	0.00	0.00
Fox	0.00	0.00	0.00
Hare	0.00	0.00	1.81
Land Otter	0.00	0.00	0.31
Lynx	0.00	0.00	0.00
Marmot	0.00	0.00	0.00
Marten	0.00	0.00	0.00
Mink	0.00	0.00	0.00
Muskrat	0.00	0.00	0.05
Porcupine	0.00	0.00	0.35
Squirrel	0.00	0.00	0.22
Weasel	0.00	0.00	0.00
Wolf	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00
Fish	1266.20	550.40	491.78
Salmon	0.00	0.00	342.28
Non-Salmon	1266.20	550.40	149.50
Marine Invertebrate	0.00	0.00	0.00
Birds and eggs	0.00	0.00	29.27
Crane	0.00	0.00	0.17
Duck	0.00	0.00	3.13
Geese	0.00	0.00	21.72

Table 3.21-12: Lower Kuskokwim Subregion Per Capita Harvests

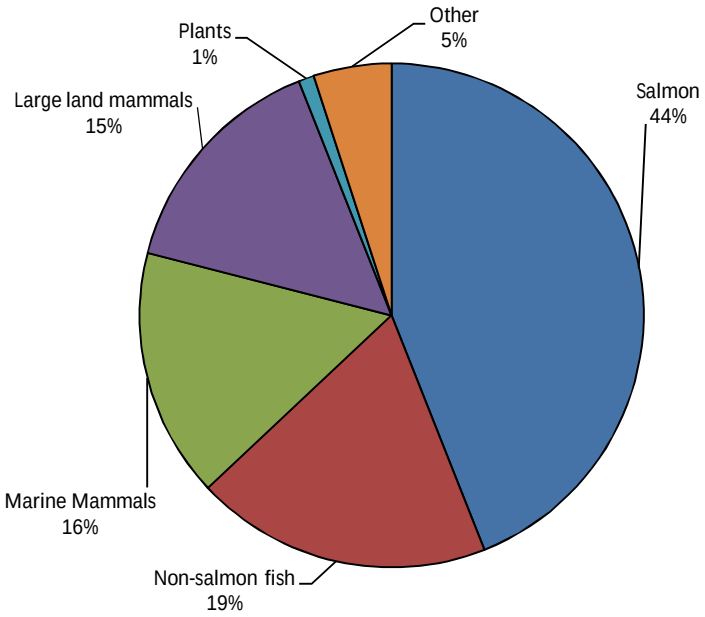
Community	Tuntutuliak*	Eek*	Quinhagak**[1]
Reference Year	**2005**	**2005**	**1982**
Seabird and loon	0.00	0.00	0.00
Shorebird	0.00	0.00	0.00
Swan	0.00	0.00	0.35
Upland Bird	0.00	0.00	3.90
Bird Eggs	0.00	0.00	0.00
Vegetation	0.00	0.00	4.48

Notes:
* There is no comprehensive harvest survey for these communities.
** Representative community.
1 The data reflects the per capita harvests of 12 households.
Source: ADF&G 2015d.

3.21.5.4.1 QUINHAGAK

Quinhagak is on the Kanektok River on the east shore of Kuskokwim Bay, less than 1 mile from the Bering Sea coast. It lies 71 miles southwest of Bethel. The city was incorporated in 1975, and had a population of 427 in 1982. In 2010, Quinhagak had a population of 689. Currently, the only subsistence harvest data available for Quinhagak come from a survey of 12 households conducted in 1983 and these data are considered to be illustrative only (Wolfe et al. 1984). The study estimated the 12 households produced an average of 3,556 pounds of wild food. ADF&G, Division of Subsistence staff conducted a household survey in Quinhagak in 2014 but that study will not be published until 2016. As a result household survey data for Quinhagak are limited. With publication of this study, Quinhagak will be the only community within lower Kuskokwim subregion to have any comprehensive survey data.

Species Harvested and Used: The study found that 44 percent of the total wild food production for Quinhagak was made up of salmon, and that salmon was the core resource (Wolfe et al. 1984). Fish other than salmon made up 19 percent of the harvest, followed by marine mammals (16 percent), and large land mammals (15 percent). Plants and berries composed 1 percent of the total harvest (Figure 3.21-30).



Source: ADF&G 2015d.

Figure 3.21-30: Composition of Quinhagak Subsistence Harvest, 1982

The data collected in 1982 was limited to harvests; no data on using or attempting to harvest was collected, nor was any data on giving and receiving collected. Slightly over 83 percent of Quinhagak households reported harvesting Chinook salmon. Just over 40 percent harvested beaver and hare, and 25 percent said they harvested moose and caribou. Fifty-eight percent of households harvested seals, some species of duck, and upland bird.

The Kanektok River supports a wide variety of fish species, including five species of salmon, char (Dolly Varden), round whitefish, grayling and rainbow trout. Of the salmon, Chinook and coho were the most abundant and, along with Dolly Varden, were considered to be staples. These fish were taken in large quantities and either dried, smoked, or frozen.

Seasonal Round and Harvest Areas: Beginning in April large quantities of arctic char (Dolly Varden), round whitefish, grayling, and rainbow trout were harvested with nets in the ice-free sections of the Kanektok River (Wolfe et al. 1984). In 1982, every household in Quinhagak harvested Dolly Varden. Late May marks the arrival of salmon. In 1982, Quinhagak residents harvested Chinook, chum, sockeye, and pink salmon with gill nets at the mouth of the Kanektok River. Over 80 percent of households reported harvesting Chinook salmon, and 50 percent or more of households said they harvested other species of salmon. In late summer and early fall, coho salmon, along with char, grayling, round whitefish, and rainbow trout are harvested from the Kanektok River. In late winter and spring, large schools of smelt appear in the lower reaches of the Kanektok River. Data shows that 75 percent of households harvested smelt.

Toward the end of April migratory waterfowl arrive and hunters begin to harvest them (Figure 3.21-31), sometimes in conjunction with seal hunting. Women gather gull eggs, and nearly 60 percent of households harvest ducks.

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Sockeye Salmon																								
Chinook Salmon																								
Chum Salmon																								
Coho Salmon																								
Pink Salmon																								
Arctic char/Dolly Varden						--	--	--	--	--	--	--												
Round Whitefish																								
Lake Trout	--	--	--	--	--								--	--	--	--	--	--	--	--	--	--	--	--
Rainbow Trout						--	--	--	--	--	--													
Arctic Grayling																								
Alaska blackfish																								
Saffron/Tom cod	--	--											--	--	--	--	--					--	--	--
Flounder																								
Yellowfin Sole																								
Smelt																								
Sculpin							--	--	--	--	--													
Roe-on-kelp						--																		
Clams, mussels							--	--																
Crabs											--	--	--											
Moose																								
Caribou																								
Brown Bear																								
Ribbon Seal																					--	--	--	--
Ringed Seal																								
Spotted Seal																								
Beluga Whale			--	--	--																			
Pacific Walrus			--	--																				
Sea Lion				--	--																			
Ducks, Geese																								
Cranes																								
Duck, Gull eggs																								
Rock Ptarmigan																								
Willow Ptarmigan																								

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Hare				--	--						--	--												
Porcupine	--	--	--	--	--	--									--	--	--	--	--	--	--	--	--	--
Squirrel																								
Beaver																							--	--
Muskrat													--	--	--									
Mink	--	--															--	--			--	--	--	--
Marmot											--	--												
Weasel	--	--															--	--	--	--	--	--	--	--
Land Otter													--	--										
Red Fox																								
Wolf	--	--															--	--	--	--	--	--	--	--
Wolverine	--	--															--	--	--	--	--	--	--	--
Lynx	--	--															--	--	--	--	--	--	--	--
Blackberries																								
Blueberries																								
Cranberries																								
Salmonberries																								
Basket grasses																								
Firewood																								

Source: Wolfe et al. 1984.

Figure 3.21-31: Quinhagak Seasonal Round of Subsistence Harvests 1983

In 1982, eight families were reported to travel to spring camps in mountain valleys above the Kanektok, Arolik, and Jacksmith rivers to hunt parka squirrels. Historically, parka squirrel skins were an important trade item and in 1982 squirrel skin parkas were a valuable prestige item.

In September and October, moose, brown bear, squirrel, and beaver are hunted up the Kanektok and Eek rivers. In 1982, 25 percent of households hunted moose and caribou. Moose were said to be abundant in the Kanektok River drainage and common along the Eek River. Both caribou and moose were hunted in the winter after freezeup. Brown bear are also taken, and some older residents considered the fat a favorite food.

Sharing: There is no data on how subsistence foods were shared or distributed between households within the community or between communities. However, it was noted that there was a wide variation in wild food production between the 12 households surveyed (from 159 pounds to 9,018 pounds) (Wolfe et al. 1984). As noted above, there are differences in subsistence production between households. To minimize the potential inequalities, Alaska Native societies have developed mechanisms for the redistribution of subsistence foods so that no one goes hungry (Wolfe et al. 1984).

The primary form of distribution is among close kinsmen belonging to large extended family groups residing in different households. This extended kin network often takes the form of parents and the households of their grown children. The basis for this sharing includes highly structured, socially defined kinship obligations such as the proper form of behavior between parents and their children or between siblings. Parents provide food to dependent children and later on children provide food to their elderly parents (Wolfe et al. 1984).

A secondary form of sharing occurs when a surplus or windfall of resources is harvested. A third form of sharing occurs between partners who are not members of the same extended families. These partnerships are often between brothers-in-laws or perpetual hunting partners who share foods at the time of production. Sharing also occurs between communities during winter ceremonials, or the celebration of birthdays, or during Russian Christmas (Wolfe et al. 1984). In Quinhagak, birthdays, especially of children, were announced community-wide. Everyone is invited and a variety of food is served including seal and reindeer stew; akutaq made of Crisco, berries, and sugar; breads; cakes; tea; and coffee.

No figures to depict sharing practices and no subsistence use area maps are available for this community.

Variability: No quantitative or interview information is available to characterize variability in subsistence harvest patterns over time for this community.

3.21.5.5 KUSKOKWIM RIVER SALMON FISHERIES

The Kuskokwim Area subsistence fishery is one of the largest in Alaska. From June through October the daily activities of many Kuskokwim households revolve around the harvesting and processing of salmon. Household survey data collected in 18 communities along the Kuskokwim River between 2010 and 2013, show that in Lower Kuskokwim communities salmon contributed 42 percent of the total subsistence harvest, 65 percent of the total harvest in Central Kuskokwim communities, and 25 percent in Upper Kuskokwim communities (Brown et al. 2012, 2013; Ikuta et al. 2014). Salmon not only provide an important source of nutrition, but also are crucial to the maintenance of cultural identity and cultural values (Fall et al. 2011).

Residents of the Kuskokwim area harvest five species of Pacific salmon for subsistence purposes: Chinook salmon, chum salmon, coho salmon, pink salmon, and sockeye salmon. Drift gillnetting, set gillnetting and hook and line are the primary methods used to harvest salmon. Dipnets are also used in some communities in response to conservation concerns over Chinook salmon. In eight Central Kuskokwim communities (Aniak, Chuathbaluk, Crooked Creek, Lower and Upper Kalskag, Red Devil, Sleetmute, and Stony River), four species of salmon comprised 65 percent of the total subsistence harvest by weight (252,458 pounds). Chinook salmon alone contributed 30 percent of the total regional harvest, chum salmon 15 percent, coho 12 percent, and sockeye 8 percent (Brown et al. 2012).

Subsistence harvest of Pacific salmon species in the Kuskokwim River is allowed without a permit (5 AAC 01.280) and with no closed season (5 AAC 01.260), unless otherwise noted for conservation purposes. Subsistence fishing on the Kuskokwim can be restricted through closures implemented by emergency order. There are no federal or state harvest limits for subsistence salmon harvests, except when fishing with a rod and reel in the Aniak River upstream of Doestock Creek from June 1 through August 31. The limit is 2 Chinook salmon.

The Alaska Department of Fish and Game is responsible for implementing regulations in accordance with the Kuskokwim River Salmon Management Plan (5 AAC 07.365). Waters of the lower Kuskokwim River are largely adjacent to or within federal public lands so ADF&G shares management with the U.S. Fish and Wildlife Service. The Kuskokwim River Salmon Management Working Group (KRSMWG) is composed of knowledgeable stakeholders representing local communities, sport fishery representatives, and ADF&G management biologists. The working groups advises state and federal managers and is the primary forum through which management decisions are made regarding all Kuskokwim river fisheries

Data collected since 1989 show a decline in reported Chinook harvests from a high of 114,219 fish in 1990 to a low of 25,336 in 2012 (Table 3.21-13). Coho and chum harvests have also declined (Fall et al. 2014). In 1990, the chum harvest was 157,335 fish compared to a recent 5-year annual average (2007-2011) of 59,269. One reason for the decline in chum harvests can be attributed to a lesser need for dog food. Historically, salmon were used to feed dog teams but the number of households harvesting salmon specifically for dogs has declined. Data from 2012 show 23,241 salmon were fed to dogs; most of this was chum salmon (Fall et al. 2014). In 2012, severe restrictions were put in place to limit the subsistence harvest and conserve Chinook salmon. As a result of the restrictions it is estimated that between 24,000 and 25,000 Chinook salmon were harvested in 2012, which is approximately 25 percent of the harvest during normal years (OSM 2014), or 70 percent below the recent 10-year average (Fall et al. 2014; Ikuta et al. 2014; see Table 3.21-13). In response to the poor return (the lowest on record since 1976), managers closed fishing on tributaries and in the mainstem of the river. At the June meeting of the KRSMWG, managers recommended a 7-day rolling closure for all subsistence salmon fishing beginning in the lower section of the Kuskokwim River Subdistrict 1-B effective June 10, 2012. By mid-June 2012, the managers implemented a 12-day rolling closures or a total of 35 days of restriction in a stepwise progression up the Kuskokwim River consistent with salmon run timing. All restrictions were lifted on July 16 (Fall et al. 2014; Ikuta et al. 2013).

The 2013 forecast for the Kuskokwim River indicated there would be enough Chinook salmon to satisfy escapement goals of 65,000 to 120,000 fish and meet subsistence harvest needs of 80,000 fish. However, because the 2012 run had been the lowest on record there was a conservation concern prompting both preseason and in-season subsistence restrictions. In 2013,

preseason management actions included closure on subsistence Chinook fishing with hook and line and restriction on gillnet mesh size and length of net in the lower tributaries. Similar restrictions were later implemented in the mainstem of the Kuskokwim River beginning in late June. Each conservation section of the river was subject to 12 days of restrictions in an attempt to allow sufficient numbers of Chinook to reach the spawning grounds. In assessing the 2013 fishing season the vast majority of families considered the Chinook catch to be "Very Good", while assessment of chum and sockeye salmon catches were mostly considered "Normal" to "Very Good" (Chavez and Shelden 2014). In 2013, subsistence users harvested an estimated 46,500 fish; more than twice as much as the previous year but still below the long-term average of 72,000 fish (OSM 2014).

For 2014 the Chinook salmon return for the Kuskokwim River was expected to be weak and below normal. As a result, major restrictions were imposed on the fishery. In April of 2014, the Federal Subsistence Board passed a proposal, submitted by the community of Napaskiak, limiting the Chinook salmon fishery to federally qualified subsistence users. Dipnets became legal gear for taking salmon other than Chinook salmon and the mesh size of set and drift gill nets was restricted to four inches. Once the fishery began in May 2014, managers instituted rolling closures. In the second week of June 2014, a limited Chinook fishery was open to those communities issued a Social/Cultural Harvest permit. This fishery was allowed in response to requests and formal proposals from tribal groups, the KRSMWG, and the Yukon Kuskokwim Regional Advisory Council. Fishing was allowed Monday, Wednesdays, and Fridays beginning June 11, 2014 and ending June 30, 2014 (OSM 2014).

3.21.5.6 KUSKOKWIM RIVER MOOSE AND CARIBOU HUNTING

Since moose and caribou are such important and productive subsistence resources through much of the EIS Analysis Area, this section discusses historic perspective, harvest trends over time, and the distribution of harvests among the three major Game Management Units (GMUs) affected by the project, namely 16B, 18, and 19.

Beginning on the west side of Cook Inlet, the proposed Donlin Gold natural gas pipeline ROW is located in GMU 16B, which includes the communities of Tyonek, Beluga, Alexander/Susitna, and Skwentna. The eastern portion of this unit, 16A, is designated a non-subsistence area under the State of Alaska management system and would not be affected by the proposed project.

Table 3.21-13: Historical Subsistence Salmon Harvests, Kuskokwim Area, 1989-2012

Year	Households		Estimated Salmon Harvest				
	Total	Surveyed	Chinook	Sockeye	Coho	Chum	Total
1989	3,422	2,135	85,322	37,088	57,786	145,106	325,387
1990	3,317	1,448	114,219	48,752	63,084	157,335	314,513
1991	3,340	2,033	79,445	50,383	44,222	89,008	298,561
1992	3,308	1,308	87,663	46,493	57,551	120,126	246,914
1993	3,269	1,786	91,973	53,625	31,659	61,027	240,103
1994	3,169	1,801	108,066	44,060	39,668	78,795	251,111
1995	3,638	1,907	105,787	31,736	39,582	71,789	236,885
1996	3,630	1,524	100,352	41,532	45,279	10,079	241,572
1997	3,501	1,919	83,022	9,827	31,324	38,073	198,466
1998	3,497	1,940	85,779	38,049	26,594	63,413	218,595
1999	4,165	2,512	76,418	49,614	29,758	46,094	202,413
2000	3,317	1,448	71,336	48,449	43,863	57,727	204,714
2001	4,469	2,215	82,106	55,290	33,474	57,060	212,338
2002	4,804	2,687	84,508	34,317	44,029	88,836	205,599
2003	4,513	2,292	70,549	33,815	36,499	41,945	194,474
2004	4,638	2,398	102,336	41,558	48,693	65,805	214,959
2005	4,603	1,593	89,538	44,637	35,793	59,220	186,762
2005	4,671	1,439	96,006	47,501	43,444	93,037	279,988
2007	4,620	1,279	101,554	50,092	37,481	76,187	265,314
2008	4,734	992	103,713	64,183	52,742	71,649	292,287
2009	4,810	1,699	82,100	37,971	32,090	45,199	197,360
2010	4,215	2,243	69,242	41,042	34,169	47,885	192,338

Table 3.21-13: Historical Subsistence Salmon Harvests, Kuskokwim Area, 1989-2012

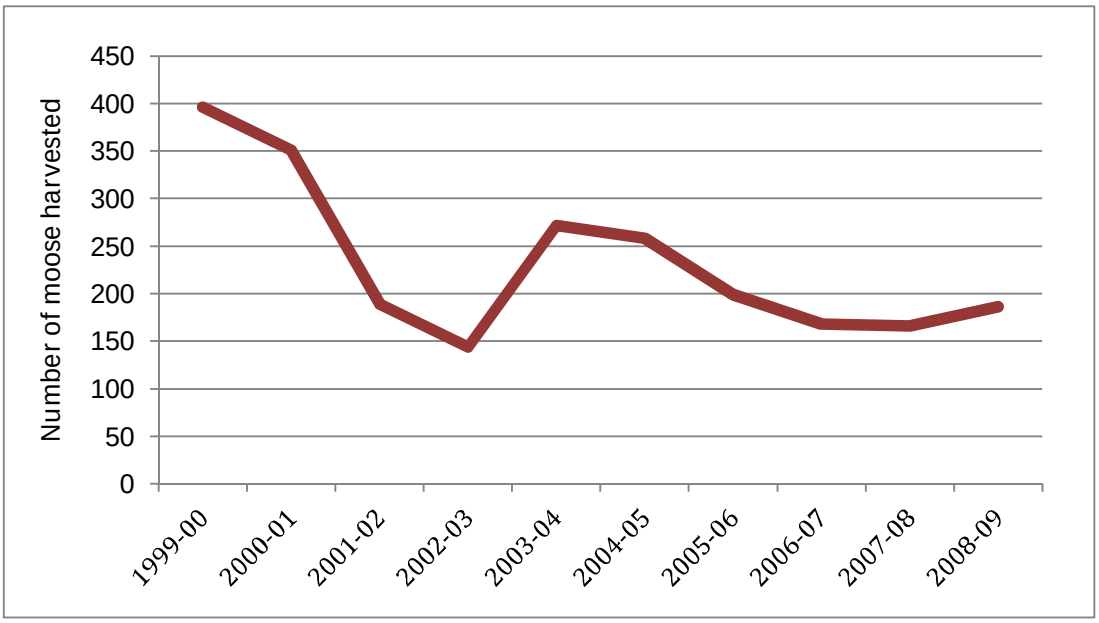
Year	Households		Estimated Salmon Harvest				
	Total	Surveyed	Chinook	Sockeye	Coho	Chum	Total
2011	4,241	1,822	65,852	46,296	33,943	55,995	202,086
2012	4,294	1,569	25,336	50,616	30,221	81,912	188,085
5-year average (2007-2011)	4,524	1,608	84,316	47,802	37,392	59,269	228,780
10-year average (2002-2011)	4,584	1,845	86,625	44,469	40,136	66,132	223,192
15-year average (1997-2011)	4,320	1,899	84,814	45,500	38,216	63,557	217,896
Historical Average (1989-2011)	3,995	1,845	89,039	45,141	41,458	77,953	235,799

Source: Fall et al. 2014

3.21.5.6.1 MOOSE

Currently, Alaska residents can hunt moose in GMU 16B under State of Alaska general season regulations, requiring a harvest ticket or a registration permit, or under a State of Alaska Tier II winter/spring hunt for bull moose. Residents of Tyonek, Skwentna, and Beluga reported that they especially rely on the Tier II winter hunt to meet their harvesting goals (Jones et al. 2015; Holen et al. 2014; Stanek et al. 2007). Skwentna and Beluga residents also reported that they face substantial competition from non-locals who put considerable pressure on overwintering moose populations (Stanek et al. 2007; Holen et al. 2014).

Figure 3.21-32 shows moose harvests in GMU 16B from 1999 to 2009. The data reflect all hunters including local and non-local hunters, federal subsistence harvests and estimated unreported and illegal harvests. The decline in harvests in 2001-2002 and 2006 through 2008 are the result of closed general season hunts produced by a decrease in moose populations (Peltier 2010a). According to ADF&G, moose populations in GMU 16B were lower than those desired by management in 2009-2010 (Peltier 2010a). Both Tyonek and Skwentna residents have reported that moose populations were down compared to previous years (Jones et al. 2015; Holen et al. 2014).



Notes:
These data include all hunters and all reported harvests including Federal Subsistence harvests as well as estimated unreported and illegal harvests.

Source: Peltier 2010a.

Figure 3.21-32: Estimated Moose Harvests, GMU 16B, 1999-2009

On the upper and central Kuskokwim River drainage, moose arrived at the turn of the 20th century and are now considered a staple food source in many communities. The history of moose hunting regulations in the Kuskokwim River drainage has been dynamic and restrictive in recent decades due to the variability of the moose population. In the early 1990s, populations in Game Management Units (GMUs) 19A and 19B began declining. The reasons for the decline were varied but as early as 1983 residents of 19A had attributed the decline to increase moose

harvest by nonlocal hunters, specifically residents from GMU 18 (Brown et al. 2012). Typically, hunters of various backgrounds hunted in both GMUs 19A and 19B, including local and downriver subsistence hunters as well as nonresident hunters.

GMU 19 is divided into four subunits, of which units 19A and 19D are at a lower elevation and accessible by boat, while units 19B and 19C are at higher elevations where access is generally by aircraft. Hunters in 19A and 19D generally live in GMU 19 or downriver in GMU 18, and hunt primarily for food (Seavoy 2010). Communities in 19A include Lime Village, Stony River, Sleetmute, Red Devil, Georgetown, Crooked Creek, Napaimute, Chuathbaluk, Aniak, Kalskag, and Lower Kalskag. Communities in GMU 19D include Telida, Nikolai, Medfra, McGrath, and Takotna.

GMU 18 encompasses all of the communities in the Lower Kuskokwim subregion, the Bering Sea Coast subregion, mouth of the Yukon subregion, the Lower Yukon subregion, and the Middle Yukon subregion. Moose densities in GMU 18 are moderate to high in the Yukon River drainage and low in the Kuskokwim River drainage. According to ADF&G, hunting pressure from communities along the Kuskokwim River has limited the growth of the moose population along the river corridor in GMU 18 (Perry 2010a).

Regulations for GMU 19 were flexible enough during the 1990s to satisfy all users groups but as moose populations declined and competition increased regulations became more conservative resulting in the complete closure of winter moose hunts in 2000 and 2001 and partial closures (to nonresident hunters) in 2002. To address the issue of declining moose populations, ADF&G and the Central Kuskokwim Fish and Game Advisory Committee established the Central Kuskokwim Moose Planning Committee in 2002. The resulting Central Kuskokwim Moose Plan (CKMP), instituted in 2004, included closure of nonresident hunting in GMU 19A, a registration hunt in 19A with permits to be issued within the subunit, and predator control. Updated moose population estimates from 2005 led the Alaska Board of Game (BOG) to implement even more conservative regulations in 2006, but a disagreement arose between communities in the CKMP. Communities in the eastern portion of GMU 19A wanted a complete closure on moose hunting while those in the western portion did not. Since 2006 there has been a moratorium on moose hunting in the eastern portion of GMU 19A. Red Devil, Sleetmute, and Stony River are within the closed area. The remainder of GMU 19A has been open to moose hunting under Tier II permit system on state land, and to federal hunts under the provisions of Section 804 of ANILCA on federal lands.

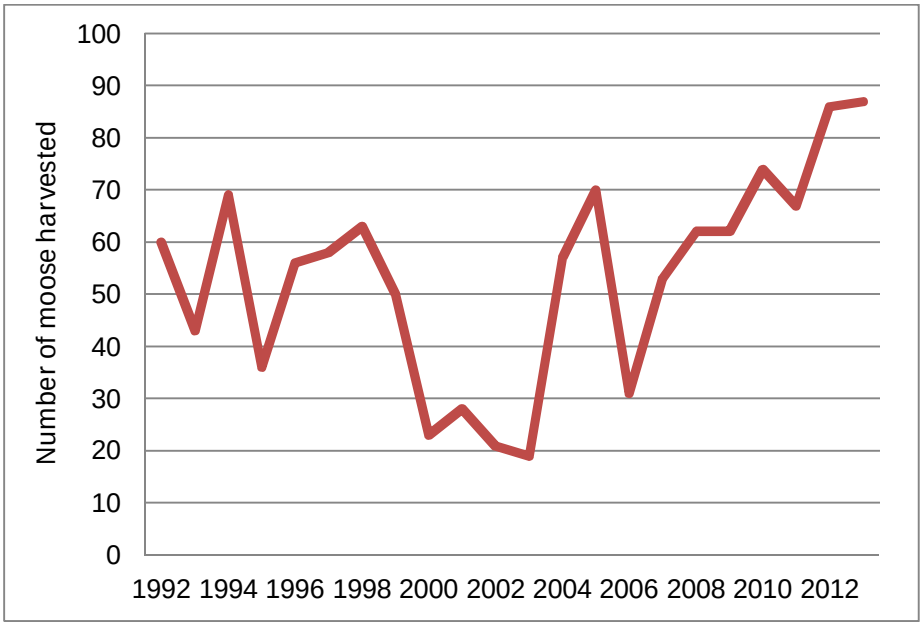
For the regulatory year 2006-2007 the BOG instituted a Tier II hunt in GMUA 19A that encompassed the area from the George River drainage down river to Upper Kalskag (Brown et al. 2013). Hunting was closed in the remainder of Unit 19A. Almost all residents of the state of Alaska are eligible to fill out a Tier II application – which measures dependence on moose within a particular GMU. Permits are awarded to applicants with the highest scores, reflecting their long-term use of the area and reliance on moose. Federal hunts are open only to federally qualified users who reside in a specific area in which residents have established a history of use of the resource. For many residents of GMU 19A Tier II permit regulations are perceived as unfair because they think most of the permits go to hunters residing outside GMU 19A, in particular to residents of GMU 18 (Brown et al. 2012).

In GMU 18, between 1960 and 2003 hunting regulations allowed 1 bull moose under general hunt provisions. However, heavy hunting pressure limited the growth of the moose population so in 2004-2005 the BOG instituted a moratorium on moose hunting in the lower Kuskokwim

drainage. In 2009-2010, the moratorium was lifted and a registration hunt was instituted, which is extremely competitive with approximately 1,000 hunters requesting permits. According to ADF&G, there are several factors influencing the moose harvests of communities in GMU 18 that are located in the Kuskokwim River drainage: a poor cash economy, coupled with a decline in commercial fishing opportunities, a decline in the Mulchatna caribou herd, and continued growth in the local human population (Perry 2010a).

In recent decades, Lower Kuskokwim communities of GMU 18 have a history of traveling long distances to hunt moose. For example, in 1998 an estimated 43 percent of successful Akiachak moose hunters harvested moose outside the lower Kuskokwim region with a majority of the harvest taking place in the central Kuskokwim region (i.e., GMU 19). This resulted in growing user conflicts and the BOG established the Holitna/Hoholitna Controlled Use Area where there is no big game hunting with any boat equipped with a motor larger than 40 horsepower (Brown et al. 2013). Very few hunters from GMU 19 hunt in other GMUs such as 18 and 21E. Trips are generally cost prohibitive because of the price of fuel, opportunity costs from the loss of wages, lack of family or social contacts outside their traditional hunting territories, and lack of familiarity with new hunting territories.

Figure 3.21-33 shows the fluctuation in moose harvests by communities in GMU 19A. Data were collected from ADF&G harvest tickets and includes community harvests in both GMUs 18 and 19. In 2009, moose comprised from 0 to 17 percent of the total subsistence harvest in Red Devil, Sleetmute, and Stony River. In the western half of GMU 19A, where there is a Tier II hunt, moose made up a greater percentage of the total harvest. As result of lower moose harvest levels residents are shifting to fish, and other resources such as beavers and black bears (Brown et al. 2012).

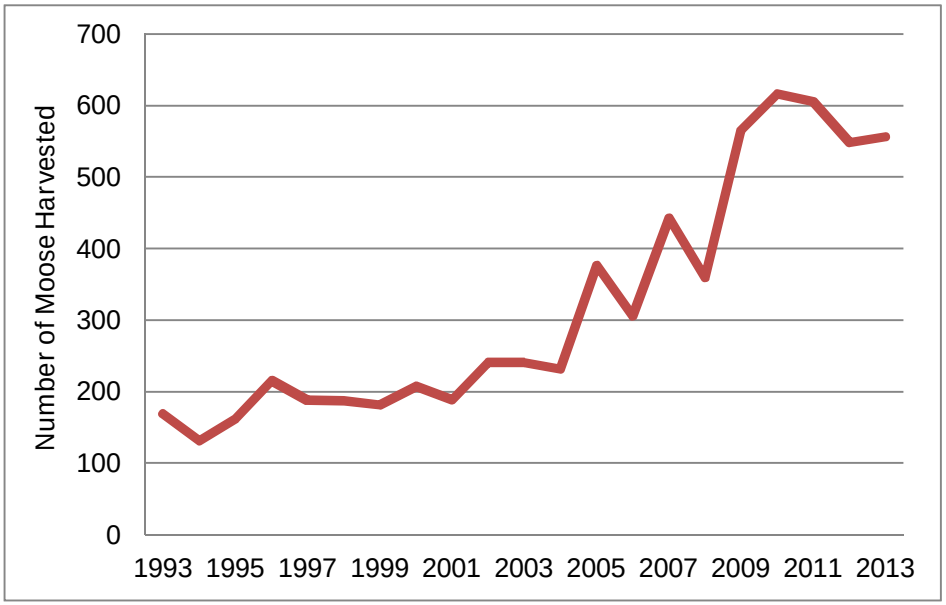


Note:
These data include local hunters from communities in GMU 19A who successfully hunted in GMUs 18 and 19 between 1992 and 2013. It does not include non-local hunters.

Source: ADF&G 2015e.

Figure 3.21-33: Historical Subsistence Moose Harvest, GMU 19A Communities, 1992-2013

Figure 3.21-34 shows a strong increase in subsistence moose harvests by residents of all communities located in GMU 18.

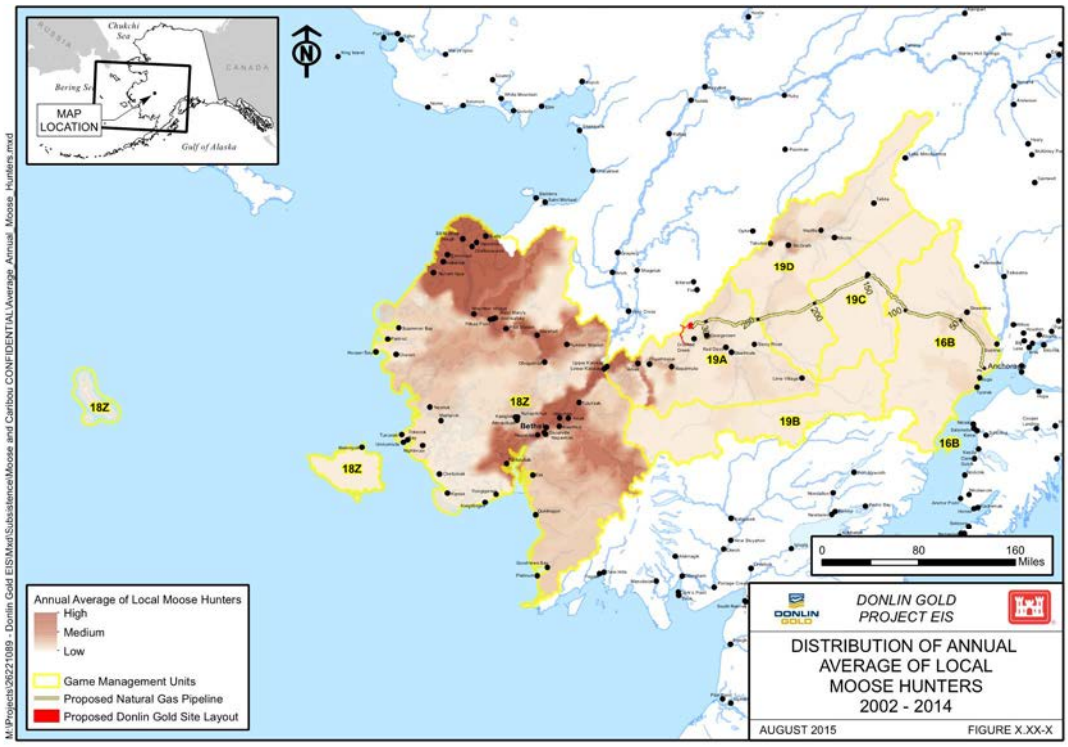


Note:
These data include local hunters from communities in GMU 18 who successfully hunted in GMUs 18 and 19 between 1993 and 2013. It does not include non-local hunters.

Source: ADF&G 2015e.

Figure 3.21-34: Historical Subsistence Moose Harvest, GMU 18 Communities, 1992-2013

Figure 3.21-35 shows the geographic distribution and density of moose hunters over a 13-year period, between 2002 and 2014 in GMUs 16B, 18 and 19. Data for this figure was supplied by ADF&G, Division of Wildlife Conservation. The map shows data for hunters from local communities only and does not include non-local or non-Alaska resident hunters. Highest densities are in GMU 18 and 19A along the river corridors and in the vicinity of communities. Medium densities occur along portions of the proposed natural gas pipeline in 16B, 19A, and 19D. Lighter densities occur in the eastern portion of 19A where there has been a moratorium on moose hunting.



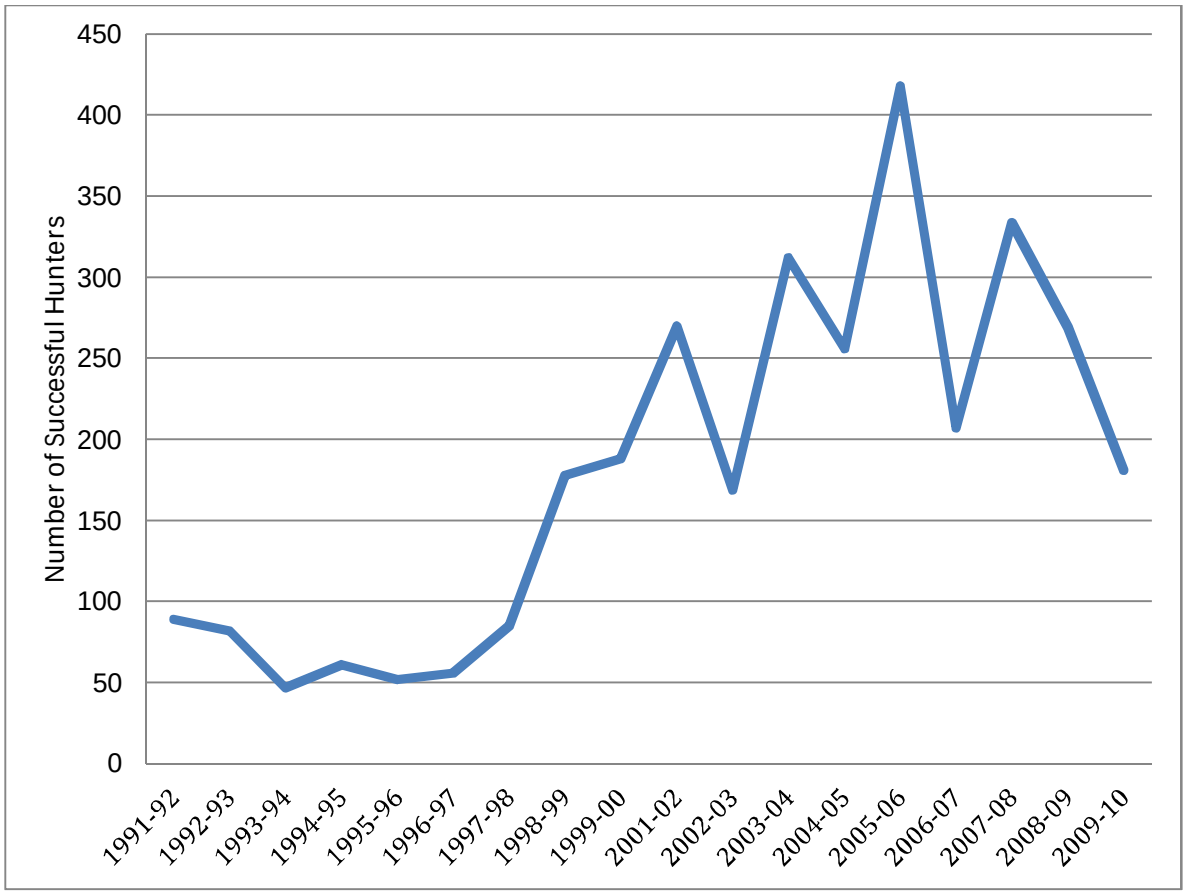
Source: ADF&G Division of Wildlife Conservation.

Figure 3.21-35: Distribution of Local Moose Hunters, GMUs 16B, 18, and 19, 2002-2014

3.21.5.6.2 CARIBOU

The primary caribou herd hunted by residents of GMUs 18 and 19 is the Mulchatna Herd. Between 1981 and 1996 this herd increased at a substantial rate due in part to a succession of mild winters, expansion into previously unused range, and low predation and harvests rates (Woolington 2011). In subsequent years, the population has declined from its peak in 1996 as the distribution of animals has become more widespread.

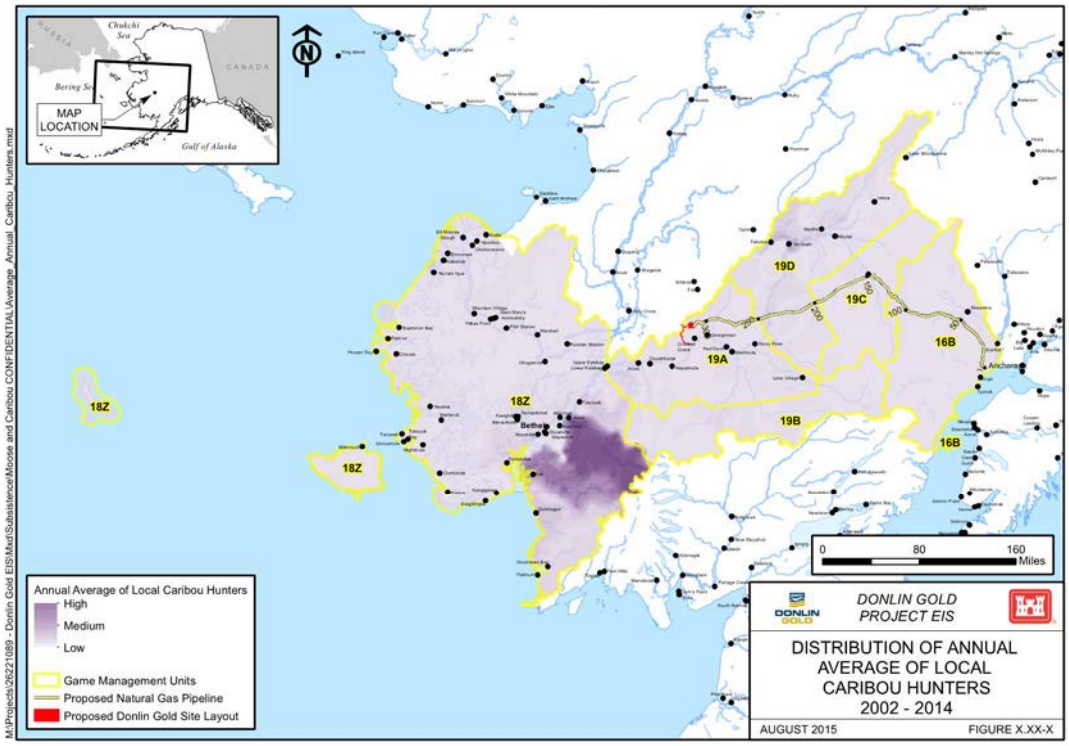
State of Alaska bag limits for caribou have reflected fluctuations in the herd; declining from 5 caribou in the regulatory years 1997-1998/2005-2006, to 3 caribou, then 2 caribou. As herd distribution has changed, so has the harvest. For example in recent years caribou contributed 4 percent to the total subsistence harvest by edible weight in Lower Kuskokwim communities (Akiak, Kwethluk, Oscarville, and Tuluksak, Napakiak, Napaskiak) (Brown et al. 2013; Ikuta et al. 2014), while in Upper (McGrath, Nikolai, Takotna and Telida) and Central Kuskokwim communities (Aniak, Chuathbaluk, Crooked Creek, Lower Kalskag, Red Devil, Sleetmute, Stony River and Upper Kalskag) caribou contributed one percent or less to the total harvest (Ikuta et al. 2014; Brown et al. 2012). Figure 3.21-36 shows the number of successful caribou hunters from communities within the range of the Mulchatna caribou herd from 1991 to 2010.



Notes:
* Includes residents of communities within the range of the Mulchatna caribou herd.
Source: Woolington 2011

Figure 3.21-36: Successful Caribou Hunters from Communities within the Mulchatna Caribou Herd Range, 1991-2010

Figure 3.21-37 shows the geographic distribution and density of caribou hunters over a 13-year period, between 2002 and 2014 in GMUs 16B, 18 and 19. The highest density occurs in the Lower Kuskokwim area where the caribou are concentrated. Medium density occurs along portions of the Upper Kuskokwim River around McGrath and Nikolai. In 2011, McGrath residents reported a harvest of only 2.6 caribou for the entire community and Nikolai residents reported only 1.5 caribou (Ikuta et al. 2014). In contrast, Kwethluk residents, located in the high density area, reported a community harvest of 110.8 caribou (Brown et al. 2013).



Source: ADF&G Division of Wildlife Conservation.

Figure 3.21-37: Distribution of Local Caribou Hunters, GMUs 16B, 18, and 19, 2002-2014

3.21.5.7 SUBSISTENCE HARVEST PATTERNS: BERING SEA COAST SUBREGION

Communities included in the Bering Sea Coast subregion are Kipnuk, Chefornak, Nightmute, Mekoryuk, Toksook Bay, Tununak, Newtok, Chevak, Hooper Bay, Paimiut, and Scammon Bay. The current population of these communities is 8,191. Paimiut has no resident population. Comprehensive harvest data is lacking for 10 of the 11 Bering Sea coast villages. There is limited harvest data for Tununak, but the technical paper for Tununak is confined to a discussion about herring. Hooper Bay was selected as an example community because there is a technical paper covering all aspects of subsistence, although the data is qualitative. Since there is no quantitative harvest data for these communities, a table showing per capita harvests for the subregion is omitted.

3.21.5.7.1 HOOPER BAY

Hooper Bay is located 20 miles south of Cape Romanzof and 25 miles south of Scammon Bay in the Yukon-Kuskokwim Delta. The city is separated into two sections: a heavily built-up townsite located on gently rolling hills and a newer section in the lowlands. Hooper Bay is located 500 miles west of Anchorage. The city government was incorporated in 1966. In 2010, the population was 1,114.

In the early 1980s, researchers worked in Hooper Bay to document the wild resource use of the community over an entire annual cycle (Stickney 1984). The research stemmed from concern about impending resource development in the area. Data from the study showed that fish, wildlife, and plant resources played an important role in the economy of Hooper Bay. Data was collected through participant observation and interviews with knowledgeable elders. Eleven households were interviewed on their subsistence activities and harvest areas (Stickney 1984). No quantitative harvest data was collected; for this reason the only figure to be presented is a seasonal round (see below). In 1981, Hooper Bay had a population of 640.

Species Harvest and Use: Hooper Bay residents harvested a wide variety of wild resources. These harvests depended primarily on the availability of the animals and time of year that it was most efficient to harvest them. People concentrated on harvesting and processing salmon when the fish were there. Different kinds of foods stimulated the senses differently; fish taste and feel different than sea mammals, salmon taste different than tomcod. Different resources keep differently; salmon is easier to dry than grayling. For these reasons all of the resources are equally important, they fit into the yearly cycle in particular ways. In her discussion of Hooper Bay, Stickney (1984) never described one resource as more important than others. As she noted about migratory birds, they provided a small portion of the overall food supply, but Hooper Bay residents told her they were a choice food that was only available for a limited time of year (Stickney 1984).

Hooper Bay residents commonly harvested three species of seals: ringed seals, spotted seals, and bearded seals. Seals were the first to migrate past the community in the spring and usually represented the first important source of fresh meat. Spring seal hunting began by the second week of April and was the active period of seal hunting during the year. Most hunting took place from Hooper Bay to Kokechik Bay. Seals were hunted along the shore fast ice so hunters sometimes ranged 30 to 40 miles offshore, out of sight of land (Stickney 1984). During the fall seal hunting was a major activity, intensifying as seal density increased with the fall migration.

Walrus migrated past the community but in the spring were often too far off shore, so were seldom hunted. Beluga whales and seals are found in Hooper Bay itself and up some of the larger rivers during the fall. The deeper Kokechik Bay hosted spawning herring and sea lions and the marshes along the south shore provide nesting habitat for dense colonies of migratory and other birds.

Migratory birds, particularly eiders, were hunted in the spring but could sometimes be found in the winter months. Various species of ducks, geese, and swans were hunted later in the spring as they moved through the area. The single largest harvest of eiders occurs in the spring. Hooper Bay residents also collected a wide variety of bird's eggs.

In the 1980s, beaver were relatively new in the area, but Hooper Bay residents harvested some beaver, usually in conjunction with other activities. During the winter Hooper Bay residents trapped for mink, land otter, red fox and arctic fox.

Hooper Bay residents are involved in a subsistence and commercial herring fishery. The subsistence fishery took place inside of Nuok Spit at Hooper Bay. The fishery took place in early May. The harvest of herring was intricately tied to the harvest of other resources. If people did not get enough herring and salmon, they shifted their focus to whitefish and tomcod. Also, if the seal harvest was poor, families harvested many more herring. Salmon were a critical

resource. Chum and Chinook were the primary species followed by pink and coho. Salmon are caught in Hooper Bay using gillnets.

The many streams that empty into Hooper Bay and extensive tidal areas host sculpin, starry flounder, Bering cisco and tomcod. Hooper Bay residents also harvested a wide variety of other salt and freshwater fish species including blackfish, burbot, Northern Pike, flounder, least cisco, Bering cisco, tomcod and Humpback whitefish (Stickney 1984). Tomcod were harvested winter and spring. People fished near the village in areas that had little tidal influence. By December tomcod fishing stopped. Blackfish was a staple winter food harvested primarily in the winter although some are harvested in the fall (Stickney 1984).

Edible plants included cowslip, wild celery, sourdock, and stinkweed for medicinal purposes; berries included salmonberries and crowberries. In the fall, Hooper Bay residents harvested "mouse foods" the stems and roots of plants gathered by rodents in the late summer and fall and buried in caches for the winter. Goose grass is gathered during the fall, and used to make baskets.

Seasonal round: The seasonal round of Hooper Bay is geared toward the harvest of migratory resources within a short period of time. Marine mammals are usually only available in the spring and fall. Salmon are available during a 3-month period while tomcod, burbot, and whitefish are available only during spawning runs (Figure 3.21-38).

Harvest Areas: Seal hunting ranges from the mouth of Kashunuk Bay to Cape Romanzof. Most hunting occurs in Hooper Bay or Kokechik Bay. Salmon harvests took place in Hooper Bay and up the various rivers flowing into the bay. Herring are harvested in the bay as well. Most other non-salmon fish species harvested in rivers flowing into Hooper Bay or within Hooper Bay itself. No maps of subsistence use areas are available.

Sharing: Sharing and distribution of wild food is widespread and often based on strict protocols as is shown in this example of seal distribution in Hooper Bay. Butchering of seals took place in the village by the women, except for bearded seals that are butchered on the ice by the men. The partner who actually shot the seal kept the blubber and hide, the intestines, most of the organs, and a majority of the meat; the other partner gets a flipper, a portion of the ribs, and other meat. Once the seals were brought back to the village they were the responsibility of the women. Different species were processed and the meat distributed in different ways. For example, spotted and ringed seals were usually not distributed beyond the family network. If the seal was the first animal caught by a young novice hunter, the meat was cut into strips and distributed to the elders (Stickney 1984). The first bearded seal was distributed widely throughout the community and is subject to strict protocol; elders receive their share first for example. Seal meat was commonly sent to relatives in other villages and any non-relative who came to a house asking for meat, received some.

Unlike seals, salmon are not subject to the same protocols. Men harvested the fish, women process them, and the processed fish are largely retained by the household. Waterfowl are not subject to village-wide distribution but retained mainly by the immediate household, although sharing occurred among the extended family network. Salmonberries are shared, but in a different way. After they are harvested the berries are made into akutaq: a mixture of Crisco, berries and sugar; a portion of which was then distributed to the elders, relatives, and anyone in the village who has been named after a deceased member of the family (Stickney 1984).

No figures to depict sharing practices are available for this community.

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
Bearded Seal						--	--					--	--			--								
Ringed Seal						--	--													--	--	--	--	--
Spotted Seal						--	--				--	--	--			--								--
Walrus			--	--	--	--																		
Beluga Whale		--	--	--	--	--																		
Bering Cisco		--						--	--	--					--						--	--	--	
Herring					--		--																	
King Salmon						--																		
Chum Salmon						--																		
Humpback Salmon						--																		
Starry Flounder						--							--											
Tomcod		--										--				--			--					
Sculpin Spp.						--							--											
Least Cisco		--									--	--									--	--	--	
Pike										--	--	--												
Blackfish	--	--											--	--	--									--
Needlefish																	--	--	--	--	--	--	--	--
Burbot																								
Mink																								
Red Fox																					--			
Arctic Fox																								
River Otter	--	--																		--	--	--	--	--
Showshoe Hare			--														--	--	--	--	--			
Tundra Hare			--														--	--	--	--	--	--		
Willow Ptarmigan				--																	--	--	--	
Rock Ptarmigan	--	--	--	--																				
Salmon Berries												--												
Crow Berries												--												
Lingonberries				--	--	--							--			--								
Basket grasses													--											
Mouse foods													--											
Driftwoods	--	--	--	--	--	--	--	--	--	--	--	--				--								

Source: Stickney 1984

Figure 3.21-38: Hooper Bay Seasonal Round of Subsistence Harvests 1984

3.21.5.8 SUBSISTENCE HARVEST PATTERNS: MOUTH OF THE YUKON SUBREGION

Communities located around the mouth of the Yukon River include the predominantly Yup'ik communities of Nunum Iqua, Alakanuk, Emmonak, Kotlik, Chuloonawick, Bill Moore's Slough, and Hamilton. The current population of this subregion is 2,159. Chuloonawick, Bill Moore's Slough, and Hamilton have no resident populations. Subsistence harvests in Lower Yukon communities involve a high reliance on fish, marine mammals, particularly seals, and moose. Harvest data for four communities shows per capita harvests from 482 pounds for Emmonak to 1,393 pounds for Nunum Iqua (Table 3.21-14). No subsistence harvest data are available for Chuloonawick, Bill Moore's Slough, and Hamilton. Emmonak was selected as the example community for the Mouth of the Yukon sub-region. Research in Emmonak was conducted in 2009.

Table 3.21-14: Mouth of the Yukon Subregion Per Capita Harvests

Community	Nunum Iqua[1]	Alakanuk[1]	Emmonak**	Kotlik[1]
Reference Year	**1980**	**1980**	**2008**	**1980**
Population of community	138	595	788	376
Number of households	23	90	179	56
All Resources in pounds	1,393.45	725.02	481.83	502.60
Marine Mammal	209.22	126.61	54.94	100.85
Seal	159.22	85.32	30.15	78.51
Sea Otter	0.00	0.00	0.00	0.00
Steller Sea Lion	0.00	2.01	0.00	0.00
Walrus	0.00	4.03	0.00	0.00
Whale	50.00	4.03	24.79	22.34
Large Land Mammal	43.57	41.15	122.89	34.68
Bison	0.00	0.00	0.00	0.00
Black Bear	0.00	0.00	0.00	0.00
Brown Bear	0.00	0.00	0.00	0.00
Caribou	9.52	0.00	0.00	4.26
Dall Sheep	0.00	0.00	0.00	0.00
Goat	0.00	0.00	0.00	0.00
Moose	34.05	41.15	122.89	30.43
Muskox	0.00	0.00	0.00	0.00
Small Land Mammal	16.08	27.89	3.07	32.27
Beaver	2.86	4.21	1.66	3.99
Coyote	0.00	0.00	0.00	0.00
Fox	0.00	0.00	0.00	0.00

Table 3.21-14: Mouth of the Yukon Subregion Per Capita Harvests

Community	Nunum Iqua[1]	Alakanuk[1]	Emmonak**	Kotlik[1]
Reference Year	**1980**	**1980**	**2008**	**1980**
Hare	6.49	16.37	1.27	16.57
Land Otter	1.43	0.58	0.10	0.73
Lynx	0.00	0.00	0.03	0.00
Marmot	0.00	0.00	0.00	0.00
Marten	0.00	0.00	0.00	0.00
Mink	0.00	0.00	0.00	0.00
Muskrat	5.30	6.73	0.02	10.98
Porcupine	0.00	0.00	0.00	0.00
Squirrel	0.00	0.00	0.00	0.00
Weasel	0.00	0.00	0.00	0.00
Wolf	0.00	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00	0.00
Fish	1,090.11	476.83	274.70	295.19
Salmon	671.61	197.57	191.52	144.09
Non-Salmon	488.50	279.65	83.18	151.17
Marine Invertebrate	0.00	0.00	0.15	0.00
Birds and Eggs	34.48	52.54	14.88	39.61
Crane	4.52	5.76	1.37	5.32
Duck	5.64	6.40	1.73	4.88
Goose	15.83	21.69	4.90	21.38
Seabird and loon	0.00	0.00	0.07	0.00
Shorebird	0.00	0.00	0.00	0.00
Swan	4.28	10.93	2.83	3.94
Upland Bird	4.19	0.00	3.70	4.09
Birds Eggs	0.00	0.00	0.36	0.00
Vegetation	0.00	0.00	11.19	0.00

Notes:
** Representative community.
1 The data reflects the per capita harvests of 7 households in Nunum Iqua, 21 in Alakanuk and 14 in Kotlik.

Source: ADF&G 2015d.

3.21.5.8.1 EMMONAK

Emmonak is a Yup'ik community located 12 miles upstream of the Bering Sea coast on the north bank of Kwiguk Pass of the Yukon River, approximately 120 miles from Bethel. In 2008,

the population was estimated at 788 people. In 2009, researchers from the Alaska Department of Fish and Game surveyed 109 of 179 households in Emmonak. Data collected did not include a seasonal round or information for a wild food harvesting and processing network. Expanding for the unsurveyed households, results of the survey show that residents of Emmonak harvested an estimated 379,803 pounds of wild foods with an average household harvest of 2,121 pounds. The average household income was $42,934 (Fall et al. 2012).

Species harvested and used: Emmonak households used an average of 22 different subsistence resources in 2008. One hundred percent of Emmonak households reported using a subsistence resource; and 94 percent reported harvesting a resource. The most widely used resource category was fish (98 percent). Other widely used resources included land mammals (97 percent), vegetation (94 percent), birds and eggs (87 percent), and marine mammals (82 percent). Vegetation was the most widely harvested resource category, followed by fish, birds and eggs, land mammals, and marine mammals (Fall et al. 2012). Percentages of Emmonak households using, harvesting, giving, and receiving specific subsistence resources are shown in Table 3.21-15.

Table 3.21-15: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Emmonak, 2008

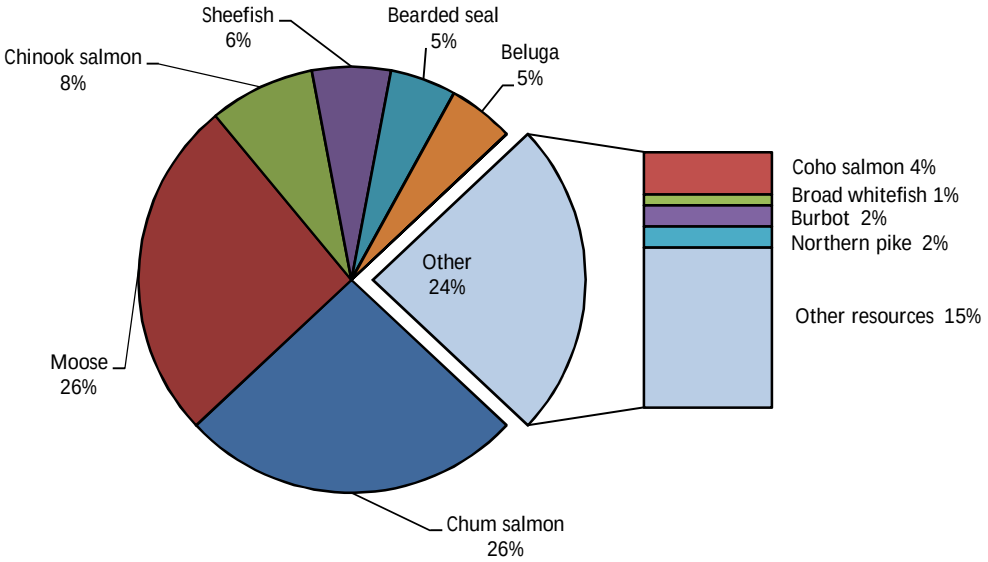
	Percentage of Households, N* 179			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	89%	52%	35%	65%
Chum	91%	67%	41%	58%
Coho	55%	34%	20%	32%
Sockeye	11%	10%	3%	3%
Pink	22%	19%	9%	8%
Non-Salmon				
Whitefish	73%	55%	37%	41%
Smelt	13%	7%	5%	6%
Land Mammals				
Black Bear	0%	0%	0%	0%
Caribou	7%	0%	1%	7%
Moose	95%	61%	52%	73%
Beaver	6%	6%	2%	2%
Hare	31%	26%	18%	10%
Muskrat	2%	2%	1%	1%
Marine Mammals				
Beluga whale	46%	13%	18%	38%
Seals	80%	42%	42%	55%
Birds and Eggs				
Ducks	62%	54%	25%	17%

Table 3.21-15: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Emmonak, 2008

	Percentage of Households, N* 179			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Geese	83%	71%	39%	38%
Upland Birds	64%	55%	30%	24%
Eggs	31%	23%	10%	
Vegetation				
Berries	84%	73%	30%	45%
Plants/greens/mushrooms	64%	60%	23%	20%
Wood	73%	68%	32%	21%

Notes:
*N = number of households in the community
Source: Fall et al. 2012

Salmon and non-salmon fish species comprised the majority of Emmonak's subsistence harvest (57 percent), followed by land mammals, marine mammals, birds and eggs and vegetation. Chum salmon and moose each made up 26 percent of the usable subsistence harvest (Figure 3.21-39). Seventy percent of the fish harvest was composed of five species of salmon: Chinook, sockeye, pink, coho, and chum (Fall et al. 2012).



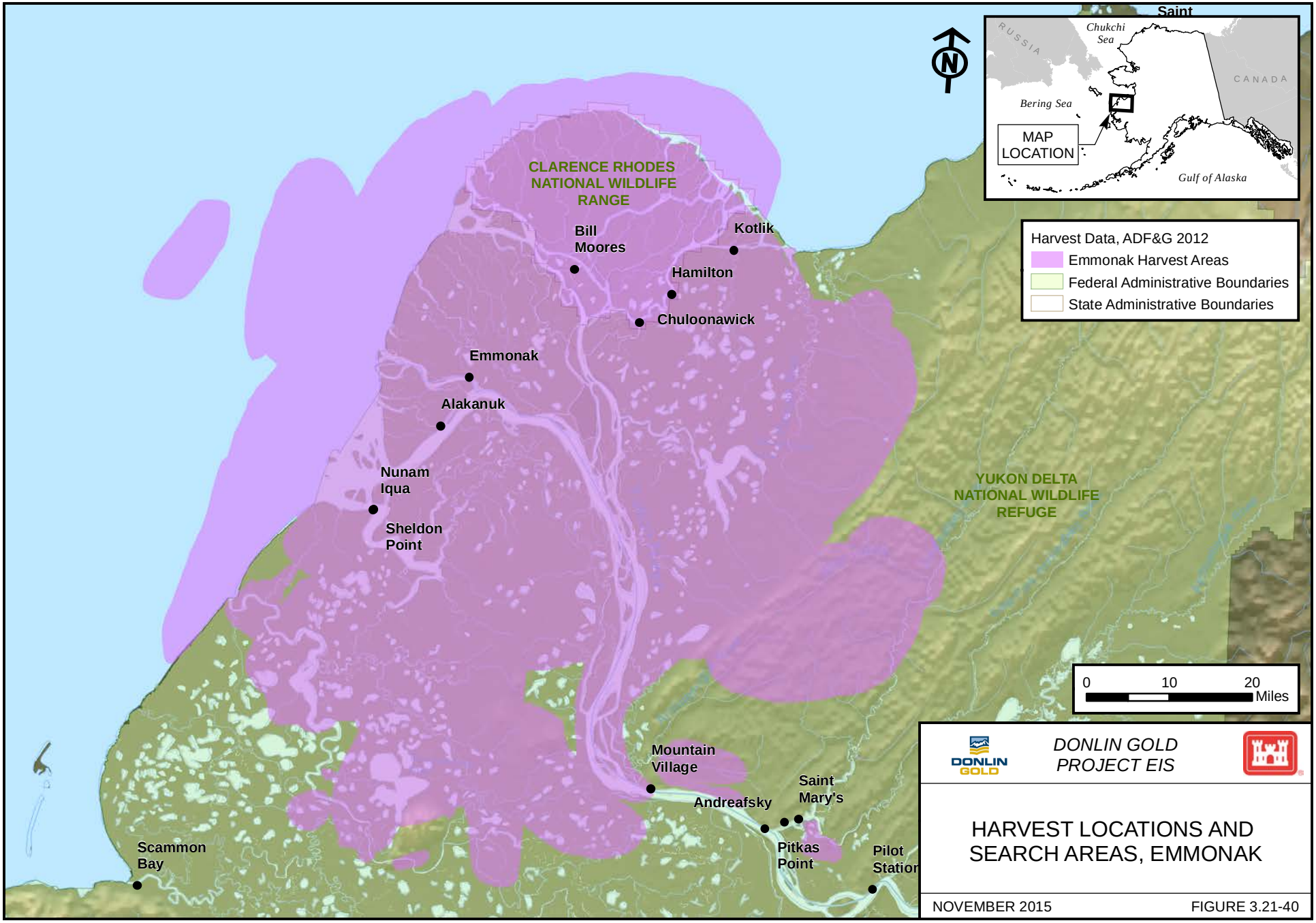
Source: Fall et al. 2012

Figure 3.21-39: Composition of Emmonak Subsistence Harvests, 2008

Harvest areas: Residents of Emmonak reported a harvest area of 6,111 square miles in 2008. This area includes most of the waters and land in the Yukon Delta downstream from Mountain Village, near shore waters and ice in the Bering Sea (Figure 3.21-40). Outlying sites extended to the Kusilvak Mountains in the south and the Andreafsky River in the east. The coastal waters and numerous channels and tributaries of the Yukon River were used as harvest locations for fish, marine mammals, and waterfowl (Fall et al. 2012). Land bordering these waters was used to hunt moose and harvest greens and berries.

Sharing: As in other Alaska Native communities, sharing of wild foods is extensive in Emmonak. Wild foods are freely given to family members, friends, and community elders who need help providing for themselves. Eighty-four percent of households reported giving away resources and 96 percent said they received wild foods (Fall et al. 2012). There are no data to depict subsistence food sharing practices for Emmonak.

Concerns: In 2008, Emmonak residents described how changing weather patterns (rainier summers and warmer winters) have altered how they hunt as have improvements in technology, such as fast reliable snow machines that have allowed them to travel further and faster. GPS [global positioning system] has become a substitute for in-depth knowledge of travel routes. Increasing costs have also led to a general decline in the level of participation in subsistence activities, which in turn affects levels of and transmission of traditional knowledge. They also noted the decline in salmon and subsequent regulatory restrictions which make it harder to harvest what they need (Fall et al. 2012).


Saint
Chukchi Sea
RUSSIA
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
N
Harvest Data, ADF&G 2012
Emmonak Harvest Areas
Federal Administrative Boundaries
State Administrative Boundaries
CLARENCE RHODES NATIONAL WILDLIFE RANGE
Bill Moores
Kotlik
Hamilton
Chuloonawick
Emmonak
Alakanuk
Nunam Iqua
Sheldon Point
YUKON DELTA NATIONAL WILDLIFE REFUGE
0
10
20
Miles
Mountain Village
Saint Mary's
Andreafsky
Pitkas Point
Pilot Station
Scammon Bay
DONLIN GOLD
DONLIN GOLD PROJECT EIS
HARVEST LOCATIONS AND SEARCH AREAS, EMMONAK
NOVEMBER 2015
FIGURE 3.21-40

3.21.5.9 SUBSISTENCE HARVEST PATTERNS: LOWER YUKON SUBREGION

The Lower Yukon River subregion includes Mountain Village, Marshall, Russian Mission, Pitka's Point, Ohogamiut, St. Mary's, and Pilot Station. The current population of the region was 3,082. There is no resident population of Ohogamiut. Residents of the lower Yukon communities have a long tradition of engaging in subsistence activities and many said that access to subsistence resources was essential to maintaining their cultural heritage, family, and community ties. Salmon, several species of non-salmon fish, and moose provide the bulk of the subsistence harvest in these communities. There are no subsistence harvest data for Pitka's Point, Ohogamiut, Saint Mary's, and Pilot Station. As shown in Table 3.21-16, per capita harvests range from 265 pounds in Mountain Village to 393 pounds in Marshall. Russian Mission was selected as the example community from this subregion.

Table 3.21-16: Lower Yukon Subregion Per Capita Harvests (pounds)

Community	Mountain Village	Marshall	Russian Mission**
Reference Year	**2010**	**2010**	**2011**
Population of community	785	341	401
Number of households	181	85	79
All Resources	264.54	393.23	329.18
Marine Mammal	14.53	5.90	3.23
Seal	6.51	5.90	0.24
Sea Otter	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00
Walrus	0.00	0.00	0.00
Whale	8.02	0.00	2.99
Large Land Mammal	60.60	71.95	107.46
Bison	0.00	0.00	0.00
Black Bear	0.00	2.70	3.21
Brown Bear	0.00	0.00	0.00
Caribou	0.00	2.11	1.81
Dall Sheep	0.00	0.00	0.00
Goat	0.00	0.00	0.00
Moose	60.60	67.14	102.45
Muskox	0.00	0.00	0.00
Small Land Mammal	2.65	5.80	4.42
Beaver	1.71	5.27	3.08
Coyote	0.00	0.00	0.00
Fox	0.00	0.00	0.00
Hare	0.85	0.41	1.03
Land Otter	0.00	0.02	0.00
Lynx	0.08	0.04	0.10
Marmot	0.00	0.00	0.00
Marten	0.00	0.00	0.00
Mink	0.00	0.00	0.09
Muskrat	0.01	0.02	0.00

Table 3.21-16: Lower Yukon Subregion Per Capita Harvests (pounds)

Community	Mountain Village	Marshall	Russian Mission**
Reference Year	**2010**	**2010**	**2011**
Porcupine	0.01	0.04	0.12
Squirrel	0.00	0.00	0.00
Weasel	0.00	0.00	0.00
Wolf	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00
Fish	167.23	287.63	199.82
Salmon	111.95	194.32	110.41
Non-Salmon	55.28	93.32	89.40
Marine Invertebrate	0.00	0.00	0.08
Birds and Eggs	9.57	13.72	9.47
Crane	0.64	0.09	0.17
Duck	1.00	1.76	1.64
Goose	3.70	4.87	3.51
Seabird and loon	0.01	0.09	0.05
Shorebird	0.00	0.00	0.00
Swan	1.90	5.46	1.20
Upland Bird	2.15	1.26	2.85
Birds Eggs	0.19	0.29	0.10
Vegetation	9.96	8.23	4.70

Notes:
** Representative community

Source: ADF&G 2015d.

3.21.5.9.1 RUSSIAN MISSION

Russian Mission is located on the west bank of the Yukon River in the Yukon-Kuskokwim Delta, 25 miles southeast of Marshall. The community lies 70 air miles northeast of Bethel and 376 miles west of Anchorage. In 2011, Russian Mission had an estimated population of 402 people. In 2012, researchers from ADF&G surveyed 46 of 79 households in Russian Mission. Expanding for the 33 unsurveyed households, Russian Mission's estimated total harvest of wild foods was 132,289 pounds or an average of 1,675 pounds per household. The mean household income was $51,352 (Ikuta et al. 2014). Note, there is no seasonal round available for Russian Mission.

Species Harvest and Use: Ninety-eight percent of Russian Mission households reported using and harvesting at least one wild resource in 2011. On average, households used 20 resources and harvested 16. Fish were the most widely used resource category (98 percent) followed by land mammals (96 percent), vegetation (89 percent), and birds and eggs (89 percent). In order, the most widely harvested categories of resources were vegetation, salmon, non-salmon fish, land mammals, and birds and eggs (Ikuta et al. 2014). Table 3.21-17 shows percentages of Russian Mission households using, harvesting, giving, and receiving specific resources.

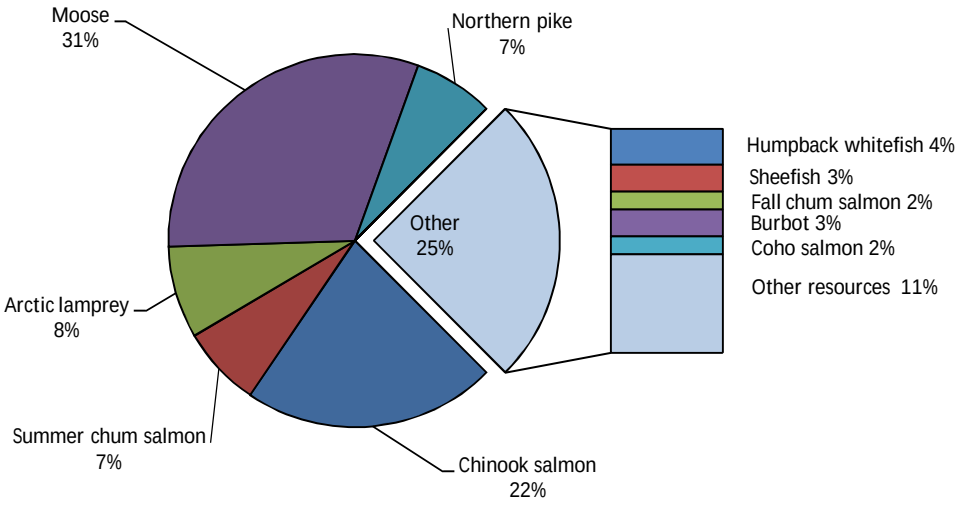
Table 3.21-17: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Russian Mission, 2011

	Percentage of Households, N* 79			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	85%	70%	28%	37%
Chum	80%	70%	33%	15%
Coho	48%	35%	13%	22%
Sockeye	4%	4%	2%	2%
Pink	2%	2%	0%	0%
Non-Salmon				
Whitefish	78%	46%	30%	48%
Smelt	13%	0%	0%	13%
Land Mammals				
Black Bear	20%	9%	7%	11%
Caribou	11%	4%	4%	7%
Moose	91%	59%	52%	52%
Beaver	33%	28%	20%	7%
Hare	37%	37%	11%	2%
Muskrat	2%	2%	2%	0%
Marine Mammals				
Beluga whale	26%	2%	7%	24%
Seals	61%	2%	2%	59%
Birds and Eggs				
Ducks	74%	63%	26%	28%
Geese	80%	63%	26%	43%
Upland Birds	61%	61%	13%	9%
Eggs	13%	13%	4%	0%
Vegetation				
Berries	13%	13%	4%	0%
Plants/greens/mushrooms	63%	59%	26%	9%
Wood	78%	74%	24%	13%

Notes:
*N = number of households in the community

Source: Ikuta et al. 2014.

Fish composed over half of the community's total harvest with 61 percent coming from both salmon and non-salmon species. Chinook salmon made up the bulk of the fish harvest (22 percent). Moose composed just over 30 percent of the total followed by Arctic lamprey, Northern Pike, and summer chum salmon. Other resources harvested by the community included various species of whitefish, coho salmon, burbot, and fall chum salmon (Figure 3.21-41). Marine mammals, black bear, and caribou contributed less than 1 percent to the total harvest.



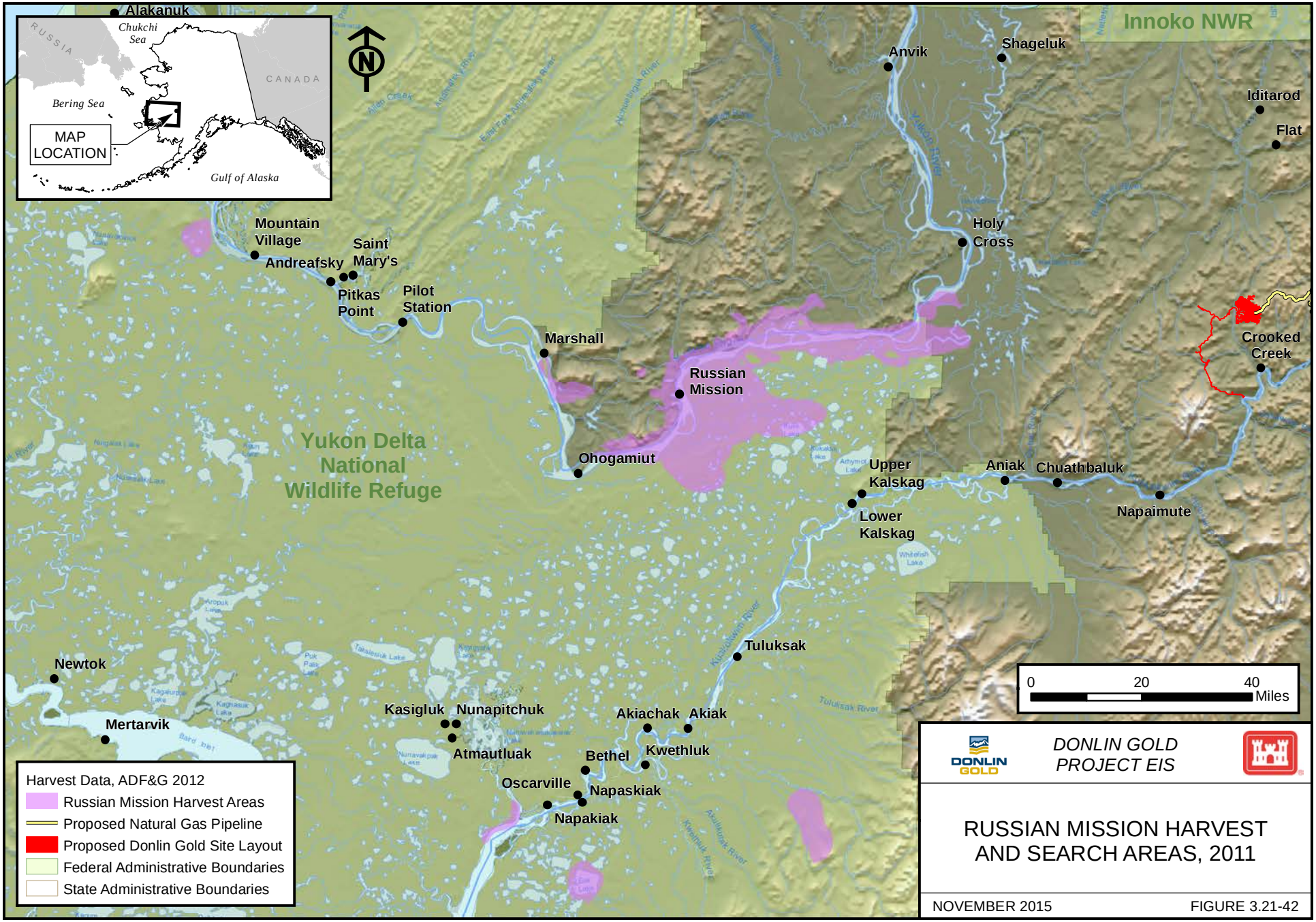
Source: Ikuta et al. 2014. Figure 10-1. Top 10 Species harvests ranked by estimated edible weight, Russian Mission, 2011.

Figure 3.21-41: Composition of Russian Mission Subsistence Harvest, 2011

Harvest areas: Households in Russian Mission reported a harvest area of 987 square miles in 2011 (Figure 3.21-42). The majority of salmon were harvested on the mainstem of the Yukon River. Harvest areas for non-salmon fish species and vegetation largely overlapped those of salmon along the Yukon River. Harvest areas for moose and black bear overlapped along the mainstem of the Yukon River. Black bear were also hunted along Paimiut Slough (Ikuta et al. 2014).

Sharing: In Russian Mission, as in other places in Alaska, traditional modes of sharing and exchange are a prominent feature of the community, with the redistribution of wild foods occurring along kinship and social connections. One resident explained the role of sharing in fostering security for households in need:

> *What I mean is, you look at village life... everybody shares with everybody, you know, make sure nobody goes hungry, and if somebody does, you know all he has to do is come and visit and then, you then... right there, banquet* (quoted in Ikuta et al. 2014).

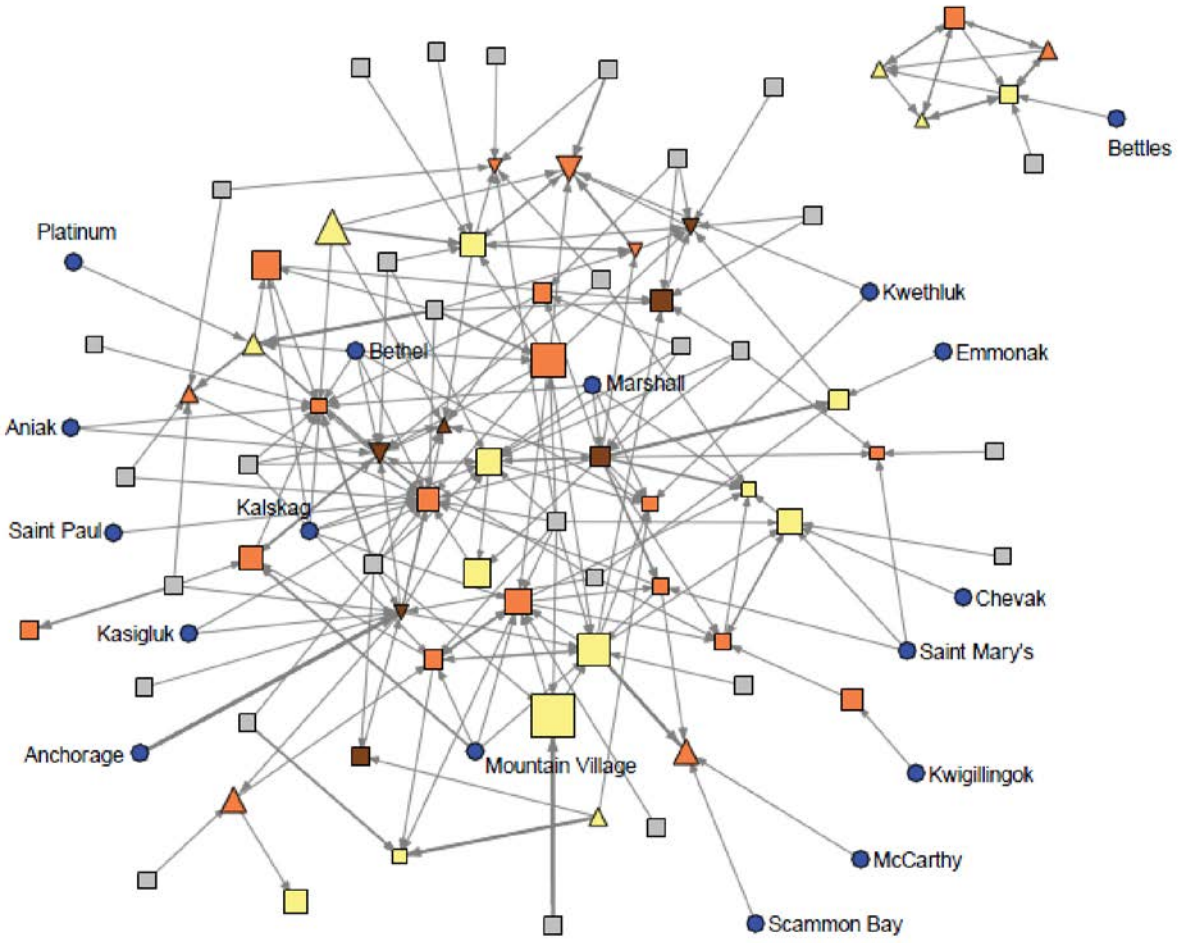

Alakanuk
Chukchi Sea
RUSSIA
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
N
Innoko NWR
Anvik
Shageluk
Iditarod
Flat
Holy Cross
Mountain Village
Andreafsky
Saint Mary's
Pitkas Point
Pilot Station
Marshall
Russian Mission
Crooked Creek
Yukon Delta National Wildlife Refuge
Ohogamiut
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napaimute
Tuluksak
Newtok
Mertarvik
Kasigluk
Nunapitchuk
Atmautluak
Akiachak
Akiak
Bethel
Kwethluk
Oscarville
Napaskiak
Napakiak
0
20
40
Miles
Harvest Data, ADF&G 2012
Russian Mission Harvest Areas
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Federal Administrative Boundaries
State Administrative Boundaries
DONLIN GOLD
DONLIN GOLD PROJECT EIS
RUSSIAN MISSION HARVEST AND SEARCH AREAS, 2011
NOVEMBER 2015
FIGURE 3.21-42

A core group of households in Russian Mission harvested and served as the primary distributors of wild foods throughout the community. These are depicted as larger nodes in Figure 3.21-43 and were headed either by single adult males or mature or married couples with large families and substantial incomes. The figure shows that Russian Mission households had connections to 16 other communities around the state of Alaska (Ikuta et al. 2014).

Concerns: In 2011, researchers from ADF&G asked residents to assess their harvest in 2011 compared to the previous 5 years. For all resource categories except berries and greens, over 50 percent of the households that responded to the question, "Did you get enough resources?" said they did get enough in 2011. Although residents were generally able to meet their subsistence needs in 2011, they voiced concern over the availability of salmon in general and Chinook salmon in particular. Residents also commented on the effect of fuel prices on pursuing subsistence activities.

3.21.5.10 SUBSISTENCE HARVEST PATTERNS: MIDDLE YUKON SUBREGION

Communities in the Middle Yukon subregion include the Athabascan communities of Holy Cross, Anvik, and Grayling on the Yukon River; and Shageluk, which is on the Innoko River. The current combined population of these communities is 344. Subsistence harvests for the three communities range from a high of 634 pounds per person in Holy Cross to 246 pounds in Grayling (Table 3.21-18). Subsistence harvests in Middle Yukon communities involve a high reliance on large moose and salmon. Grayling was chosen as the representative community for this subregion.



LEGEND

	Age of household head (years)			
	< 40	40 to 59	> 59	Unknown
Couple head	□	□	■	□
Single female head	▽	▽	▼	▽
Single male head	△	△	▲	△

Flows of wild foods from source harvesting and processing households to consuming households, as reported by consuming (surveyed) households

Household not surveyed

Household in another community

SYMBOLS are scaled by households' total subsistence harvests (in edible pounds). Surveyed households with many sources of goods and services appear near the center of the figure. Households with fewer sources appear around the edges.

LINES are scaled by the number of resources harvested and processed by other households for surveyed households. Arrows point from source households to surveyed households. A household's production for itself is not shown.

Data Sources: ADF&G (2011)

DONLIN GOLD

DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK, RUSSIAN MISSION, 2011

NOVEMBER 2015 FIGURE 3.21-43

Table 3.21-18: Subsistence Resource Pounds Harvested Per Capita in Directly Affected Communities, Middle Yukon Subregion

Community	Anvik	Grayling**	Shageluk	Holy Cross
Reference Year	**2011**	**2011**	**1990**	**1990**
Population of community	88	212	123	274
Number of households	32	55	40	63
All Resources	390.92	245.78	445.25	633.68
Marine Mammal				0.00
Seal	0.00	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00	0.00
Walrus	0.00	0.00	0.00	0.00
Beluga whale	0.00	0.00	0.00	0.00
Large Land Mammal	90.00	58.73	126.06	0.00
Bison	0.00	0.00	0.00	321.83
Black Bear	0.00	0.00	0.00	0.00
Brown Bear	0.00	0.00	0.00	5.40
Caribou	0.00	0.00	0.00	0.00
Dall Sheep	0.00	0.00	0.00	2.02
Moose	90.00	58.10	126.06	314.42
Muskox	0.00	0.00	0.00	0.00
Small Land Mammal	19.32	15.38	8.22	68.57
Beaver	19.09	15.38	7.58	63.02
Coyote	0.00	0.00	0.00	0.00
Fox	0.00	0.00	0.00	0.00
Hare	0.00	0.00	0.65	5.55
Land Otter	0.00	0.00	0.00	0.00
Lynx	0.00	0.00	0.00	0.00
Marmot	0.00	0.00	0.00	0.00
Marten	0.00	0.00	0.00	0.00
Mink	0.15	0.00	0.00	0.00
Muskrat	0.00	0.00	0.00	0.00
Porcupine	0.08	0.00	0.00	0.00
Squirrel	0.00	0.00	0.00	0.00
Fish	266.57	159.22	299.30	202.11
Salmon	231.78	121.86	157.87	121.18
Non-Salmon	34.79	37.36	141.43	80.93
Marine Invertebrate	0.00	0.00	0.00	0.00
Bird and Egg	12.81	7.89	9.08	28.51
Duck	4.7	1.57	1.96	3.41
Goose	5.5	3.84	6.30	21.77
Swan	0.00	0.00	0.00	0.04
Upland Bird	2.62	2.41	0.82	3.29

Table 3.21-18: Subsistence Resource Pounds Harvested Per Capita in Directly Affected Communities, Middle Yukon Subregion

Community	Anvik	Grayling**	Shageluk	Holy Cross
Reference Year	**2011**	**2011**	**1990**	**1990**
Bird Egg	0.00	0.00	0.00	0.00
Vegetation	2.2	4.55	2.58	12.65

Notes:
** Representative community
Source: ADF&G 2015d.

3.21.5.10.1 GRAYLING

Grayling is an Athabascan community located on the west bank of the Yukon River approximately 350 miles from the mouth of the Yukon. In 2012, the population was estimated at 212 people. Researchers from the Alaska Department of Fish and Game surveyed 41 of 55 households in the winter of 2012. Expanding for the 14 unsurveyed households, Grayling residents harvested and estimated 52,094 pounds of wild foods, with an average household harvest of 947 pounds. The average household income was $34,161 (Ikuta et al. 2014). Note, there is no seasonal round available for Grayling.

Species harvested and used: The most widely used subsistence resources were salmon, land mammals, non-salmon fish species, vegetation, and birds and eggs. The most widely harvested resources were berries and greens, non-salmon fish, salmon, birds and eggs, and land mammals. A few households used or harvested marine mammals and invertebrates. More households reported using (98 percent) and harvesting (66 percent) Chinook salmon than any other fish species. Moose were the most widely used (98 percent) and harvested (39 percent) of all land mammals (Table 3.21-19). Slightly more households reported the use of moose than vegetation (93 percent), and just over 90 percent of households reported the harvest of vegetation.

Table 3.21-19: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Grayling, 2009

	Percentage of Households, N* 55			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Salmon				
Chinook	98%	66%	32%	49%
Chum	59%	37%	29%	27%
Coho	24%	17%	7%	7%
Sockeye	7%	7%	5%	0%
Pink	0%	0%	0%	0%
Non-Salmon				
Whitefish	59%	46%	22%	24%

Table 3.21-19: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Grayling, 2009

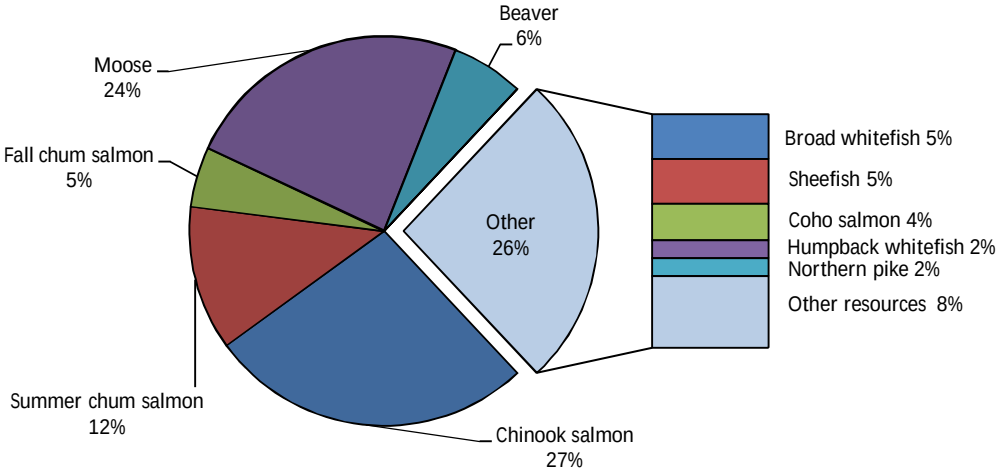
	Percentage of Households, N* 55			
	Using	**Harvesting**	**Giving Away**	**Receiving**
Smelt	5%	2%	5%	2%
Land Mammals				
Black Bear	7%	2%	2%	7%
Caribou	0%	0%	0%	0%
Moose	98%	39%	34%	71%
Beaver	37%	22%	15%	20%
Hare	0%	0%	0%	0%
Muskrat	2%	0%	0%	2%
Marine Mammals				
Beluga whale	7%	0%	5%	7%
Seals	7%	0%	5%	7%
Birds and Eggs				
Ducks	22%	17%	15%	10%
Geese	32%	22%	20%	15%
Upland Birds	61%	56%	24%	15%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	71%	68%	24%	22%
Plants/greens/mushrooms	27%	27%	7%	0%
Wood	71%	59%	22%	20%

Notes:
*N = number of households in the community

Source: Ikuta et al. 2014.

The top ten resources harvested, in terms of edible weight, were Chinook salmon, summer chum salmon, fall chum salmon, moose, beaver, broad whitefish, sheefish, coho salmon, humpback whitefish, and northern pike (Figure 3.21-44). Other species harvested by Grayling residents were several species of Whitefish, vegetation, and black bear. The community did not report any harvest of caribou in 2011 (Ikuta et al. 2014).

Harvest areas: Grayling residents reported a harvest area of 1,164 square miles in 2011. Much of the subsistence harvest activities pursued by Grayling residents occur along the river corridors (Ikuta et al. 2014) (Figure 3.21-45). The main search and harvest areas for salmon, non-salmon fish and vegetation are located upriver from Grayling on the Yukon River, along the Innoko River, and Shageluk Slough. Moose are hunted up and down the Yukon from the village.

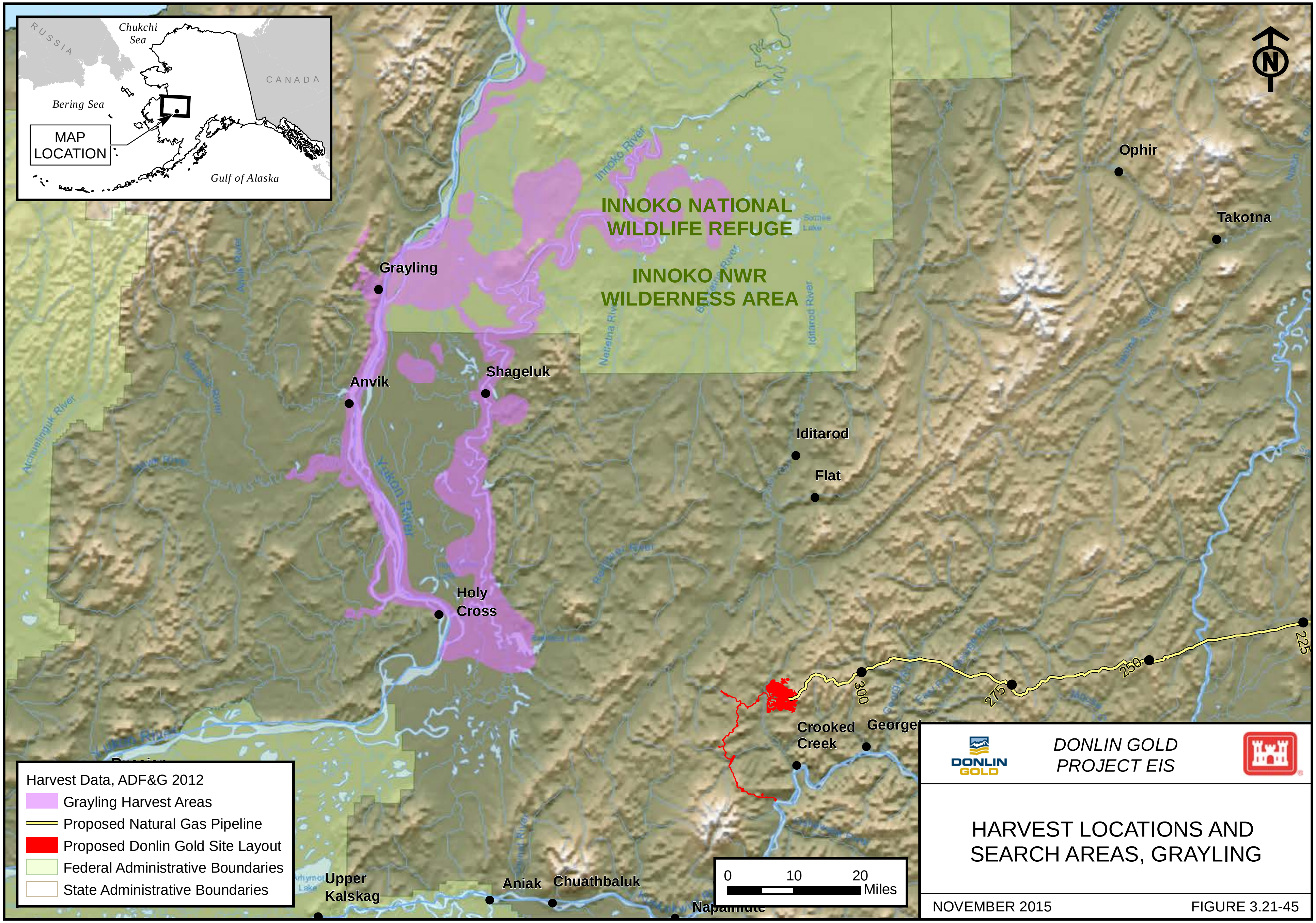


Source: Ikuta et al. 2014. Figure 9-1. Top 10 Species harvests ranked by estimated edible weight, Grayling, 2011.

Figure 3.21-44: Composition of Grayling Subsistence Harvests, 2011

Sharing: As in other Alaska Native communities, sharing of wild foods is extensive in Grayling and links the community to at least 13 other communities in Alaska. Figure 3.21-46 shows sharing networks within Grayling as well as outside the community. The figure shows several high harvesting households depicted as larger nodes. A married couple heads almost every one of these households. One of the most notable features of the network figure for Grayling is that every household in the village has at least one connection to another household.

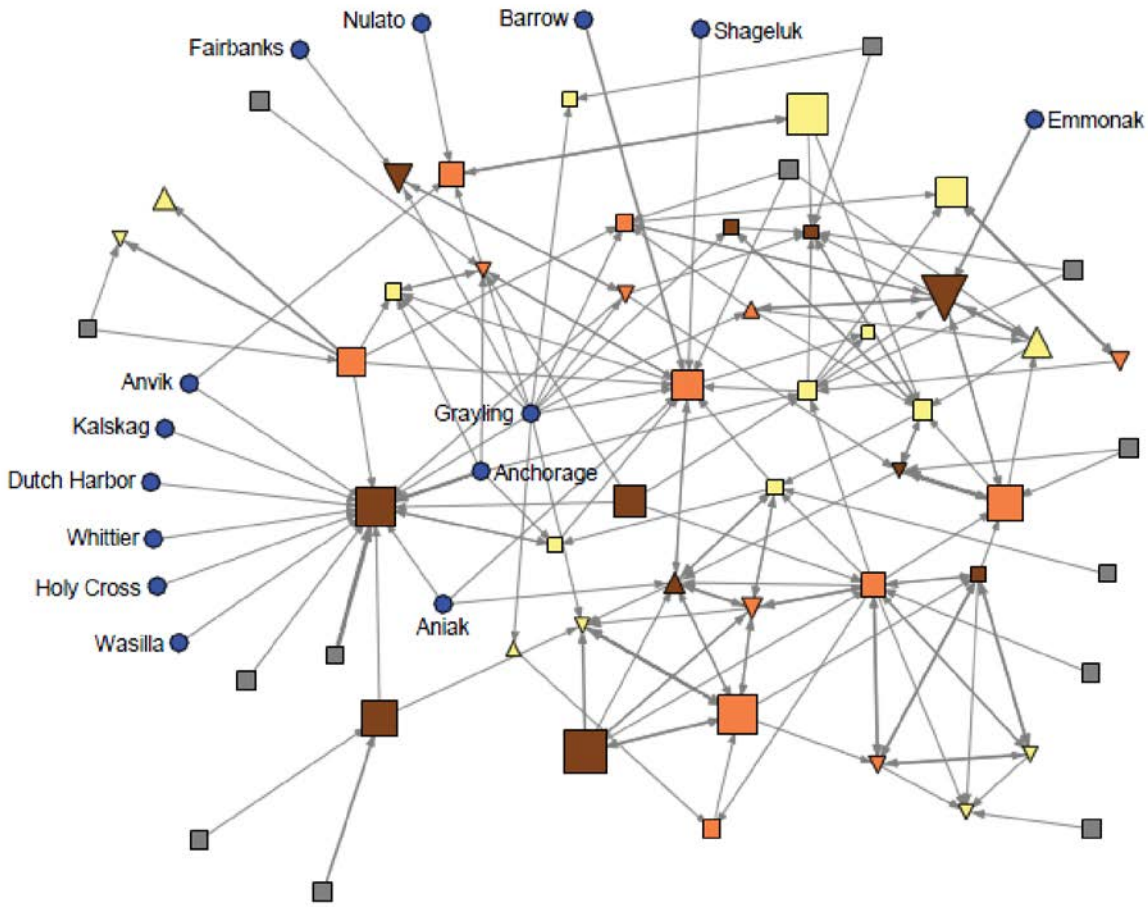
Concerns: For four resource categories: salmon, non-salmon fish, land mammals, and birds and eggs, a majority of households that responded to the question, "Did you get enough resources?" said they did get enough in 2011. Although residents were generally able to meet their subsistence needs in 2011, over 60 percent of households interviewed said they used less salmon and less vegetation than in previous years. One reason for using less salmon was the restrictions placed on harvesting Chinook salmon (Ikuta et al. 2014).



HARVEST LOCATIONS AND SEARCH AREAS, GRAYLING

NOVEMBER 2015

FIGURE 3.21-45



LEGEND

	Age of household head (years)			
	< 40	40 to 59	> 59	Unknown
Couple head	□	□	□	□
Single female head	▽	▽	▽	▽
Single male head	△	△	△	△

Flows of wild foods from source harvesting and processing households to consuming households, as reported by consuming (surveyed) households

Household not surveyed

Household in another community

SYMBOLS are scaled by households' total subsistence harvests (in edible pounds). Surveyed households with many sources of goods and services appear near the center of the figure. Households with fewer sources appear around the edges.

LINES are scaled by the number of resources harvested and processed by other households for surveyed households. Arrows point from source households to surveyed households. A household's production for itself is not shown.

Data Sources: ADF&G (2011)

DONLIN GOLD

DONLIN GOLD PROJECT EIS

WILD FOOD HARVESTING AND PROCESSING NETWORK, GRAYLING, 2011

NOVEMBER 2015 FIGURE 3.21-46

3.21.5.11 SUBSISTENCE HARVEST PATTERNS: COOK INLET SUBREGION

The Cook Inlet subregion includes the communities of Skwentna, Tyonek and Beluga. The current population of these three communities is 228. In 2006, ADF&G's Division of Subsistence conducted a comprehensive harvest survey in these communities, updating baseline information first documented in the 1980s (Stanek et al. 2007). Seventy-one percent of all year-round households were interviewed in Tyonek, as were 93 percent in Beluga. In the 2005-2006 study year, the harvest and use of wild renewable resources were important components of the economy and way of life in Tyonek and Beluga. Most community members participated in wild resource harvesting and processing. Tyonek residents harvested 217 pounds of usable weight per person, and Beluga residents harvested 204 pounds per person. In both communities, salmon made up the largest portion of the harvest, but land mammals, other fish, birds, small game, marine invertebrates, and wild plants were also important, as were marine mammals in Tyonek. In 2013, researchers from the ADF&G, Division of Subsistence conducted a household survey in Skwentna and interviewed 86 percent of all year-round households (Holen et al. 2014). In the 2012 study year, every household in Skwentna reported using and harvesting a wild resource. Residents harvested 161 pounds of usable weight per person. Large land mammals made up the largest portion of the harvest, followed by salmon, and non-salmon fish species (see Table 3.21-20).

Table 3.21-20: Cook Inlet Subregion Per Capita Harvests (pounds)

Community	Tyonek**	Beluga	Skwentna
Reference Year	**2006**	**2006**	**2012**
Population of community	199	21	62
Number of households	68	15	35
All Resources	216.70	204	161.2
Marine Mammal	4.20	0.00	0.00
Seal	0.8	0.00	0.00
Sea Otter	0.00	0.00	0.00
Steller Sea Lion	0.00	0.00	0.00
Walrus	0.00	0.00	0.00
Beluga Whale	3.50	0.00	0.00
Large Land Mammal	39.90	60.6	71.8
Bison	0.00	0.00	0.00
Black Bear	2.40	0.00	8.8
Brown Bear	0.00	0.00	2.8
Caribou	0.00	0.00	0.00
Dall Sheep	0.00	0.00	0.00
Deer	0.00	0.00	0.8
Goat	0.00	0.00	0.00
Moose	37.50	43.8	59.4
Muskox	0.00	7.4	0.00
Small Land Mammal	1.00	0.1	1.4
Beaver	0.50	0.00	0.6
Coyote	0.00	0.00	0.00

Table 3.21-20: Cook Inlet Subregion Per Capita Harvests (pounds)

Community	Tyonek**	Beluga	Skwentna
Reference Year	2006	2006	2012
Fox	0.00	0.00	0.00
Hare	0.00	0.1	0.6
Land Otter	0.00	0.00	0.00
Lynx	0.00	0.00	0.00
Marmot	0.00	0.00	0.00
Marten	0.00	0.00	0.00
Mink	0.00	0.00	0.00
Muskrat	0.00	0.00	0.00
Porcupine	0.40	0.00	0.00
Squirrel	0.00	0.00	0.2
Weasel	0.00	0.00	0.00
Wolf	0.00	0.00	0.00
Wolverine	0.00	0.00	0.00
Fish	161.00	123.7	73.7
Salmon	150.60	87.6	54.3
Non-Salmon	10.40	36.2	19.5
Marine Invertebrate	1.20	1.7	2.1
Birds and Eggs	2.80	6.7	4.2
Crane	0.20	0.5	0.3
Duck	1.20	0.9	1.1
Goose	0.60	0.7	0.00
Seabird and loon	0.00	0.00	0.00
Shorebird	0.00	0.00	0.00
Swan	0.00	0.00	0.00
Upland Bird	0.80	4.7	2.8
Birds Eggs	0.00	0.00	0.00
Vegetation	6.5	11.1	7.9

Notes:
** Representative community

Source: ADF&G 2015d.

3.21.5.11.1 TYONEK

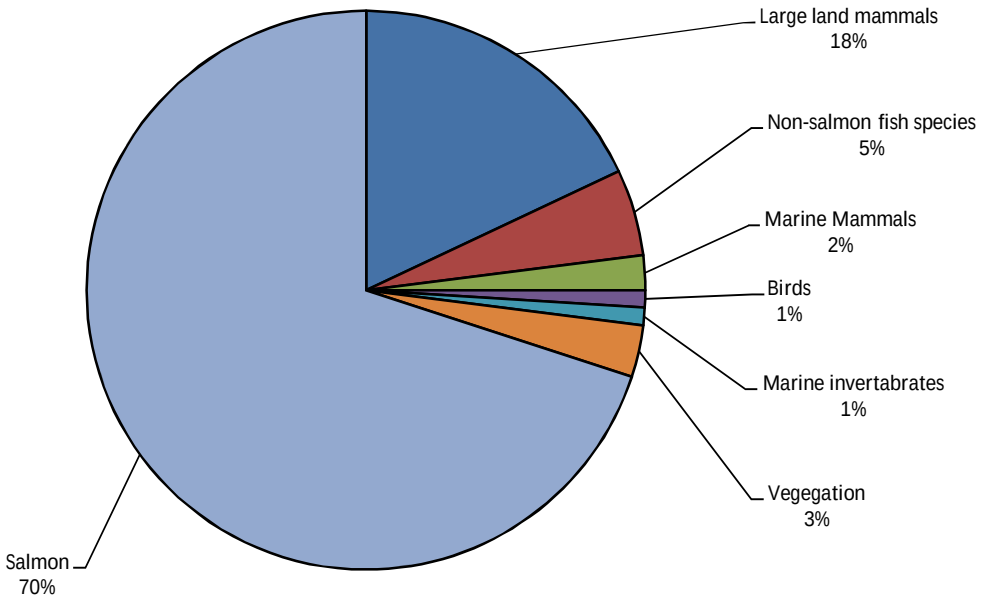
Tyonek is a Dena'ina Athabascan community that lies on a bluff on the northwest shore of Cook Inlet, 43 miles southwest of Anchorage. In 2010, Tyonek had a population of 171. In August 2006, researchers from ADF&G, Division of Subsistence conducted a household survey in Tyonek to update baseline subsistence harvest information collected in the 1980s, and to provide information to support NEPA review and permitting of PacRim Coal's proposed Chuitna Coal Project. The data in the study relates to the period August 1, 2005 through July 31,

2006. Information collected on Tyonek subsistence during this study did not include a seasonal round or data on a wild food harvesting and processing network.

Researchers from the ADF&G interviewed 47 of 68 households in Tyonek. During the study year, Tyonek residents harvested an estimated 43,829 pounds of wild resources; an average of 664 pounds per household, or 217 pounds per person. The average household income was $31,353 with a per capita income of $10,233 (Stanek et al. 2007).

Species Harvest and Use: Salmon provided 70 percent of the total usable harvest weight, while large mammals provided 18 percent, and non-salmon fish species 5 percent (Figure 3.21-47).

Ninety-six percent of households said they used a subsistence resource and 94 percent reported harvesting a subsistence resource. Edible plants (91 percent), Chinook salmon (85 percent), and moose (83 percent) were the most widely used resources, followed by non-salmon fish species (57 percent), and marine mammals (47 percent). In terms of harvest, a large majority of households harvested Chinook salmon (72 percent) and edible plants (91 percent), but far fewer households harvested non-salmon fish (28 percent), moose (19 percent), or sea mammals (4 percent). No one reported a harvest of caribou (Table 3.21-21).



Source: Stanek et al. 2007. Figure 3. Wild Resource Harvests by category, Tyonek, 2005-2006.

Figure 3.21-47: Composition of Tyonek Subsistence Harvest, 2005-06

Table 3.21-21: Percentage of Households Using, Harvesting, Giving and Receiving Subsistence Resources by Category, Tyonek, 2005-06

	Percentage of Households			
	Using	**Harvesting**	**Giving away**	**Receiving**
Salmon				
Chinook	85%	72%	47%	47%
Chum	0%	0%	0%	0%
Coho	69%	57%	40%	40%
Sockeye	34%	32%	17%	17%
Pink	6%	6%	0%	0%
Non-Salmon				
Whitefish	0%	0%	0%	0%
Smelt	45%	19%	17%	32%
Land Mammals				
Black Bear	4%	4%	2%	0%
Caribou	0%	0%	0%	0%
Moose	83%	19%	43%	77%
Beaver	17%	13%	11%	4%
Hare	2%	2%	2%	0%
Muskrat	0%	0%	0%	0%
Marine Mammals				
Beluga whale	47%	2%	28%	43%
Seals	10%	4%	6%	4%
Birds and Eggs				
Ducks	32%	26%	21%	11%
Geese	15%	15%	13%	2%
Upland Birds	28%	26%	15%	4%
Eggs	0%	0%	0%	0%
Vegetation				
Berries	75%	70%	39%	21%
Plants/greens/mushrooms	33%	28%	11%	9%
Wood	85%	85%	38%	24%

Source: Stanek et al. 2007.

Tyonek's salmon harvest was composed largely of Chinook and coho salmon. Sockeye were taken in small quantities, usually incidental to the harvest of Chinook. Most salmon were harvested with subsistence setnets. Some salmon were also harvested with rod and reel, which typically occurred during fall hunting trips.

Harvest Areas: Tyonek residents fished for salmon in Cook Inlet along the beach from Granite Point north to the mouth of the Chuitna River and the McArthur and Chakachatna rivers. Areas used by Tyonek residents to hunt large land mammals extend from north of the Beluga River to Trading Bay Flats and along the McArthur River in south Trading Bay. Moose hunting area shifts between the fall and winter seasons as the ground freezes and opens areas up to travel.

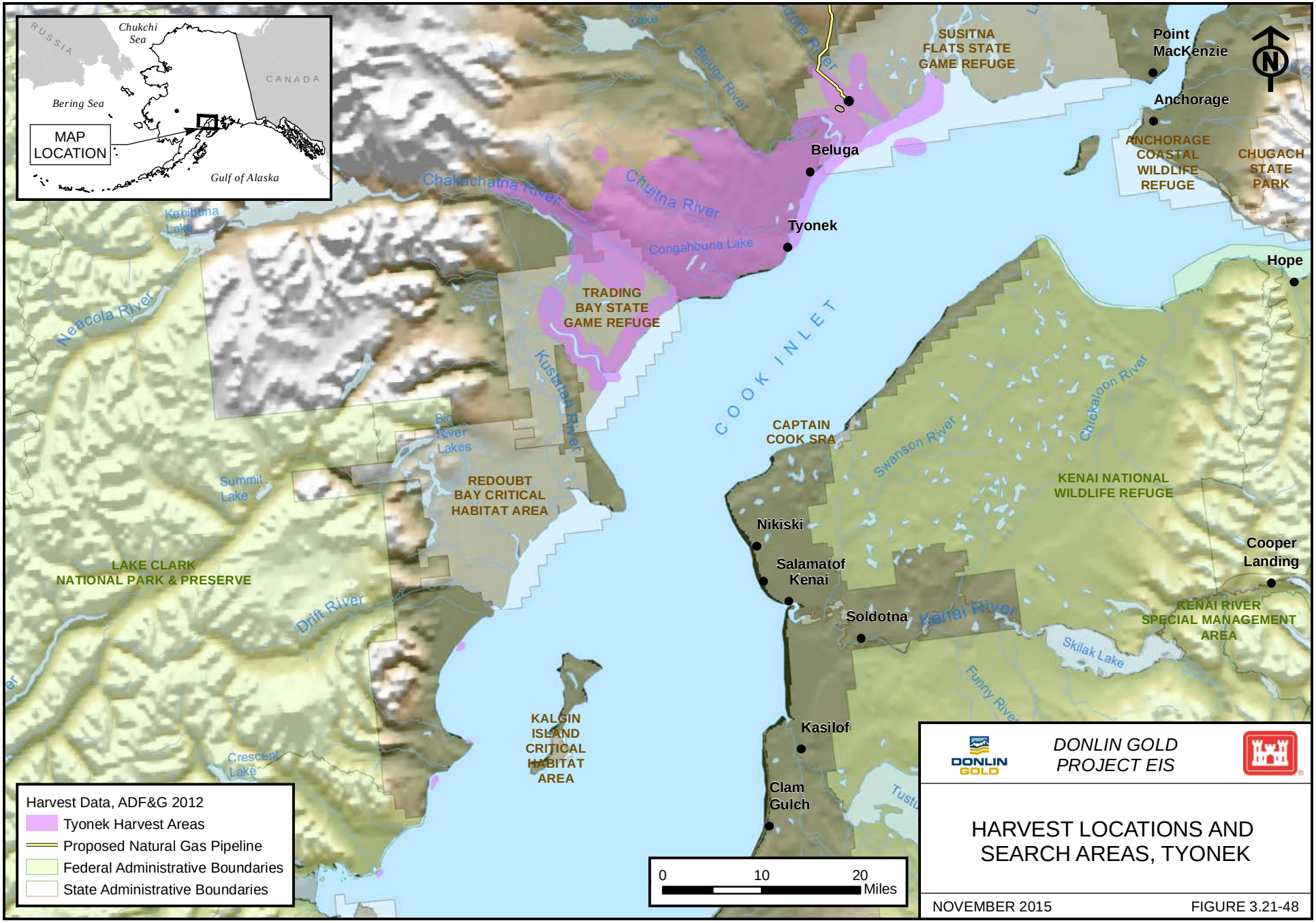
Marine mammals were hunted around the mouths of the Susitna and Beluga rivers, MacArthur River, and the west Cook Inlet shoreline. Edible plants and wood were harvested south of the Beluga River to Trading Bay Flats and along the lower McArthur River (see Figure 3.21-48).

Sharing: Sharing of resources was widespread in Tyonek. Over 90 percent of households reported receiving a resource and over 80 percent said they have given resources to other households (Stanek et al. 2007). Residents noted that the sharing of moose products including the meat, internal organs, and the nose and tongue, is an integral part of Tyonek culture. Over 75 percent of households received moose during the study year. There is no figure to depict wild food harvesting and processing networks.

Variability: In 1983-84, Tyonek residents harvested 260 pounds per capita compared to 217 pounds in 2005-06. The difference was in the harvest of salmon and land mammals that were lower than in the early 1980s (187 pounds versus 151 pounds for salmon, and 56 pounds versus 41 pounds for large land mammals). Moose had provided a large portion of food for Tyonek residents. In the early 1980s, they reported harvesting more than 30 moose per year, but in 2005-06 Tyonek residents harvested only 17 moose. On the other hand, Tyonek residents in 2005-06 did report higher per capita harvests of non-salmon fish species, marine mammals, birds and eggs, and edible plants than in the early 1980s.

Moose abundance has been an issue in Tyonek for several years. In 2005-06, Tyonek residents said that local moose population had been in decline and there was increased competition from urban residents. They also noted that because of warmer weather moose remained at higher elevations making it difficult and costly to hunt. Residents also said that the price of gasoline had affected their ability to hunt the local road system. Residents said that it has been longer than 5 years since they have had open and reliable opportunities to harvest moose (Stanek et al. 2007).

Respect for subsistence resources, especially moose, was an overarching theme in the concerns related by Tyonek residents. In relation to possible development in the area, Tyonek residents said that if large numbers of non-locals settle in the area to work in a proposed coal mine they may not show respect for the animals. They feared that non-locals would show disrespect by killing animals indiscriminately and not use the meat. Residents also worried that they would be displaced from traditional hunting areas.


RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
SUSITNA FLATS STATE GAME REFUGE
Point MacKenzie
Anchorage
ANCHORAGE COASTAL WILDLIFE REFUGE
CHUGACH STATE PARK
Beluga
Tyonek
Hope
Beluga River
Chakachatna River
Chuitna River
Congahbuna Lake
Kenibuna Lake
TRADING BAY STATE GAME REFUGE
Neacola River
Kustatan River
COOK INLET
CAPTAIN COOK SRA
Swanson River
Chickaloon River
KENAI NATIONAL WILDLIFE REFUGE
Big River Lakes
Summit Lake
REDOUBT BAY CRITICAL HABITAT AREA
Nikiski
Salamatof
Kenai
Cooper Landing
LAKE CLARK NATIONAL PARK & PRESERVE
Drift River
Soldotna
Kenai River
KENAI RIVER SPECIAL MANAGEMENT AREA
Skilak Lake
Funny River
KALGIN ISLAND CRITICAL HABITAT AREA
Kasilof
Crescent Lake
Clam Gulch
Harvest Data, ADF&G 2012
Tyonek Harvest Areas
Proposed Natural Gas Pipeline
Federal Administrative Boundaries
State Administrative Boundaries
0
10
20
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
HARVEST LOCATIONS AND SEARCH AREAS, TYONEK
NOVEMBER 2015
FIGURE 3.21-48

3.21.5.12 CLIMATE CHANGE

Climate change has recently affected, and will continue to affect, temperature and precipitation regimes, timing of breakup and freezeup, river water flow, ice thickness in winter, wetlands, vegetation, fish and wildlife habitats and populations (see Section 3.26, Climate Change).

Subsistence resource populations are subject to a large degree of year-to-year variations, with an important degree of uncertainty as to the causes. Climate change is likely a contributing factor to recent declines in moose populations in unit 19A and Kuskokwim River chinook runs. However, with the current state of knowledge, it is not possible to definitively identify the degree to which climate change, among many other factors, is causing the declines.

One of the most important recent and ongoing effects on subsistence uses due to climate change is less predictable ice thickness and more widespread and frequent instance of open water in the winter. For the Kuskokwim River area, the ANTHC Local Observer Network includes observations for the Kuskokwim River of recent low snow years, early breakup, thin river ice, and open water in winter, which may be related to climate warming. For example, observations in Bethel in 2014 document a mild winter, very low snow conditions, and thin river ice in the months of January through April. These changes and uncertainties make for very dangerous winter ice-travel conditions.

3.21.6 ENVIRONMENTAL CONSEQUENCES

Throughout the Scoping meetings, Alaska Native residents of the EIS Analysis Area emphasized their desire to protect and maintain their cultural traditions and subsistence way of life. This section examines the potential impacts of project activities at the mine site, transportation facilities, and the natural gas pipeline on the subsistence patterns of residents in the EIS Analysis Area communities.

As described in Section 3.21.5, subsistence patterns include harvests of a wide diversity of species taken in the seasonal round, subsistence use areas of community-based groups, and sharing practices. Examples of subsistence impacts could include reductions in harvest quantities, changes in the ways that harvesting and processing are done, shifts of areas for harvesting, and reductions in the times of harvest activities. Impacts on subsistence can occur through direct or indirect pathways and mechanisms, such as changes in wildlife resources, or changes in the composition of family groups that harvest and process.

The following section identifies potential types of impacts to subsistence focusing on Section 810 of the ANILCA, Alaska subsistence literature, and comments from local residents (Section 3.21.6.1). The subsections that follow analyze and estimate the likely levels of impacts associated with each of the project alternatives. The intensity, duration, geographic extent, and context of impacts are assessed for the three project components (mine site, transportation facilities, and natural gas pipeline) and phases. Where impacts differ among the phases of construction, operations, and closure, descriptions are provided.

3.21.6.1 ANALYZING IMPACTS TO SUBSISTENCE

3.21.6.1.1 POTENTIAL IMPACTS IDENTIFIED UNDER ANILCA SECTION 810

Section 810 of ANILCA requires a review of the potential for federal land management activities to "significantly restrict" subsistence uses and needs. A formal Section 810 analysis of the proposed BLM lease for a portion of the natural gas pipeline ROW will be found in Appendix N.

ANILCA Section 810 implementation policies in the Department of the Interior have been developed and revised over the years. These guidelines identify three types of potential impacts:

- Restrictions of subsistence uses due to reductions in abundance or availability of subsistence resources resulting from habitat loss, environmental pollution, direct mortality, and disturbance and alteration of their normal locations or migration patterns;
- Restrictions of subsistence uses due to reduced or restricted access to formerly used harvest areas, including physical and legal barriers; and
- Restrictions of subsistence uses due to increased competition for subsistence resources. This can include competition from non-local workers associated with the project, but also changes in subsistence uses by rural residents, increasing competition in some areas.

3.21.6.1.2 POTENTIAL FOR PERCEIVED IMPACTS TO WATERFOWL

During the scoping meetings, concern was voiced regarding the potential for migratory waterfowl to absorb contaminants from the project water containment facilities, notably the TSF, and after closure from the pit lake. During the Exxon Valdez Oil Spill, an analysis of impacts to subsistence found that the perception of contamination led subsistence hunters and fishers to avoid certain wild foods, independent of whether the fish and wildlife showed elevated contamination levels in their tissue (Fall et al. 2001). On this basis, the potential impact of perceived contamination of waterfowl from the mine site is addressed in this analysis. This will include a review of conclusions regarding exposure time and likely contamination of waterfowl from the Ecological Risk Assessment (ERA) in Section 3.12.2.1.1, Wildlife, to put into context the issue of actual and perceived risk of contamination (ARCADIS 2013b; ERM 2015; see Appendix S). Based on the ERA, Section 3.12.5.2.2 concluded:

> As discussed in Section3.12.2.1, birds are not likely to remain long due in open water areas despite earlier thaw or later freezing due to the lack of food resources. Water is also a major attractant to birds for bathing purposes. Post-bath preening could cause ingestion of water and contaminants present on the feathers. Landbirds aren't expected to bathe in most of the open water areas because they have been designed to be too deep for them to stand in. The primary exposure for birds would be from drinking or bathing in the water during any brief stopovers during migration.
>
> Considering representative exposure assumptions, the lack of attractive habitat features, and chronic intense disturbance from mining equipment, birds are not expected to be at

risk from ingestion of potentially toxic water from the TSF or from ingestion of potentially toxic food and sediment.

Based on the calculations and discussion of exposure in the ERA, no birds would be expected to be at risk from ingestion of water during the filling stage of the pit lake or from ingestion of surface water, sediment, or food from the mature pit lake.

The discussion of perceived contamination of subsistence resources will focus on waterfowl, since waterfowl could have exposure to contaminated water bodies within routine project operations, whereas subsistence fish would not be exposed to the TSF or pit lake in routine operations.

3.21.6.1.3 POTENTIAL SOCIO-CULTURAL IMPACTS

In addition to the impacts addressed under ANILCA Section 810, a number of potential socio-cultural impacts to subsistence need to be examined. Alaska studies of subsistence, international studies of mine impacts on indigenous people (especially in Canada), and comments during the Donlin Gold EIS Scoping meetings suggest a number of potential socio-cultural impacts to consider. Further insights into potential socio-cultural impacts were gained through two Subsistence and Traditional Ecological Knowledge workshops with local residents in Aniak in November 2013 and in Anchorage in March 2014. Representatives of many EIS Analysis Area villages attended these meetings. Another source of information on socio-cultural impacts to subsistence was a series of interviews with 32 respondents that were conducted in seven Central Kuskokwim communities[5] and Bethel during July and August 2014 (AECOM 2015a).[6]

Changes in Population

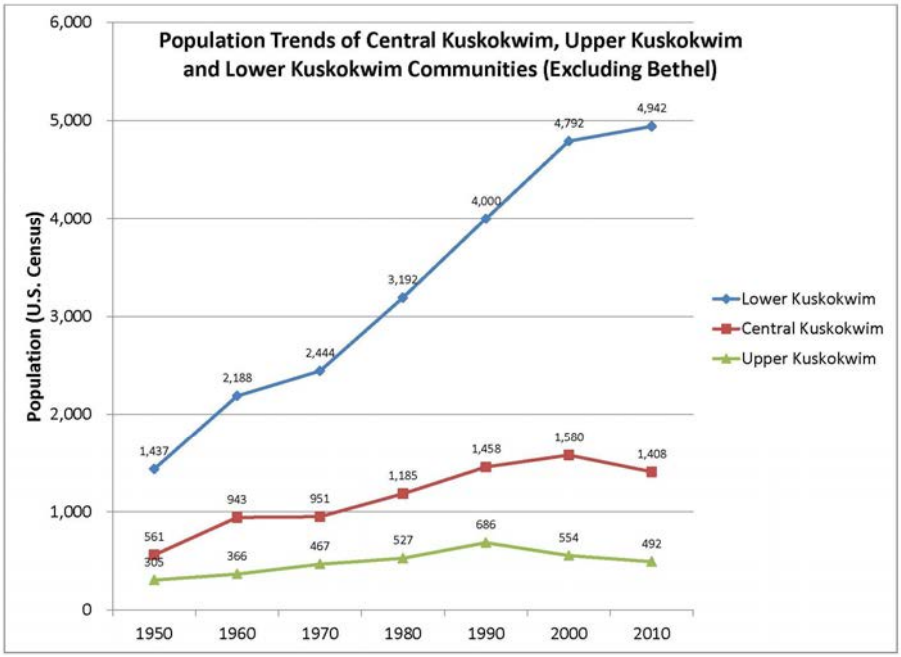
The subsistence-reliant communities of the EIS Analysis Area include those that are growing and shrinking in population size due to many causes, including natural increases (births and deaths) and migration (in-migration and out-migration). Changes in employment and income may lead to changes in the size of community populations, which may affect subsistence harvests. Small communities with declining populations may be vulnerable to continuing decline, in which case the important subsistence traditions of that community would suffer and perhaps be lost. Large communities with growing populations may also have growing needs for subsistence resources, and this may contribute to greater competition with other communities and subregions.

Small communities in the Kuskokwim River basin appear to be demographically vulnerable, with big effects from a few families moving away. In contrast, the larger communities of the region appear more demographically robust, with continuing rates of population growth. Recent population trends on the Kuskokwim River show declines for the Central and Upper Kuskokwim communities, and population growth in the Lower Kuskokwim River communities

[5] The seven Central Kuskokwim River villages are: Stony River, Sleetmute, Crooked Creek, Chuathbaluk, Aniak, Upper Kalskag, and Lower Kalskag.

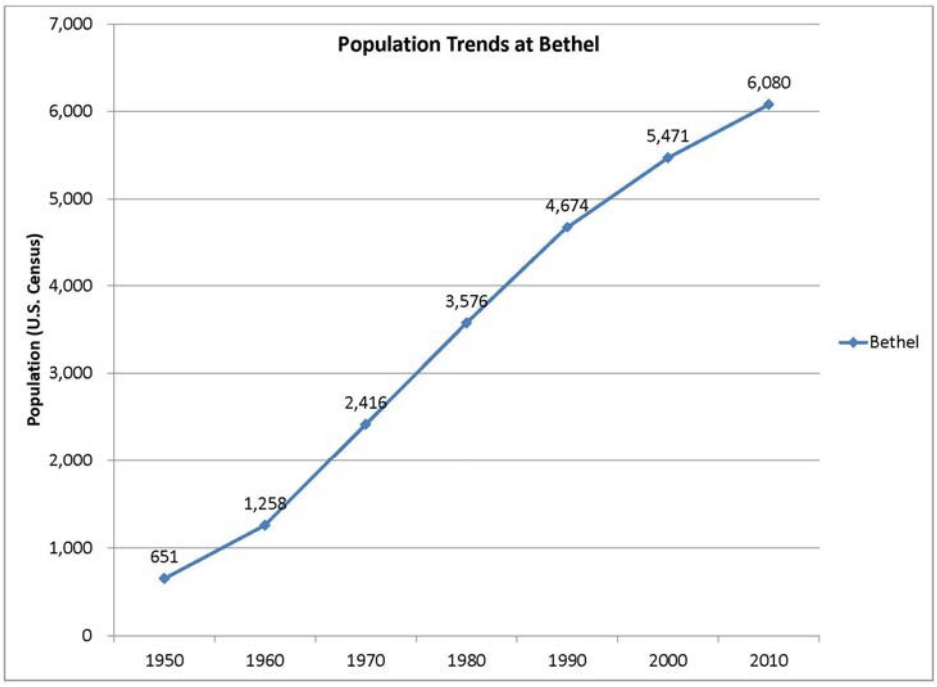
[6] The results of the 2014 interviewing on the Kuskokwim River (AECOM 2015a) show striking parallels to results from a study conducted by the North Slave Metis Alliance (2001), considering the potential impacts of changes in employment, income, and work shift schedules from the proposed Diavik Diamond Mine Project in the Northwest Territories, Canada. For a summary of comparative results, see AECOM 2015a.

(Figure 3.21-49); with especially high growth for Bethel, the largest community on the Kuskokwim River (Figure 3.21-50). These declines in the smaller communities are related to outmigration due to high costs (especially high energy costs) and declining levels of paid employment and income. Currently several communities have populations near or less than 100 people (Chuathbaluk, Crooked Creek, Lime Village, Nikolai, Red Devil, Sleetmute, Stony River, and Takotna), and four communities do not have year-round resident populations (Georgetown, Napaimute, Telida, and Medfra). These four communities do have tribal members and some return to the area to pursue traditional hunting and fishing activities, which represents a relatively new subsistence pattern based on seasonal movements between urban to rural areas.



Source: USCB 2013b.

Figure 3.21-49: Population Trend of Central Kuskokwim, Upper Kuskokwim, and Lower Kuskokwim Communities (excluding Bethel)



Source: USCB 2013b.

Figure 3.21-50: Population Trends at Bethel

Estimated population changes in the next 30 years differ between subregions on the Kuskokwim River, according to projections based on census data prepared by ADOL (Bishop et al. 2007). This study examined birth rates and migration rates to generate estimates. It did not take into account any new large scale economic projects in the regions, such as the proposed Donlin Gold Project. The Department of Labor predicts that the Bethel Census Area (including the Central Kuskokwim communities) will see population growth of just less than 1 percent per year, from a 2012 population of 17,600 to a 2042 population of 23,696. In contrast, the Yukon-Koyukuk Census Area (which includes the Upper Kuskokwim villages) is predicted to decline by just less than 1 percent per year, from a 2012 population of 5,682 to a 2042 population of 4,411.

From these large census area projections, it appears likely that the Upper Kuskokwim River villages would continue the decline seen from 1990–2010 into the next 30 years and that the communities of the Central Kuskokwim River would continue the decline seen in 2000-2010 into the next 30 years. In contrast, the larger communities of the lower Kuskokwim River (below Lower Kalskag) are likely to continue to grow.

Employment at the proposed Donlin Gold mine may reverse the trend of out-migration in the Upper and Central Kuskokwim Subregions and some families that might have otherwise moved away, may stay due to new employment opportunities. This would contribute to stable or increased community populations, and stable or increased subsistence harvests. On the other hand, employment at the mine may increase out migration resulting in even greater population decline, and in the extreme case the possible disappearance of unique subsistence patterns and cultural traditions based in particular communities.

Employment opportunities may augment the trend of population growth in the larger communities of the lower Kuskokwim River. A large portion of the employment and income from the mine may go to residents of Bethel, the regional center in the Kuskokwim drainage, and to residents of other communities in the Lower Kuskokwim subregion. This could lead to increases in population above current projections by the Alaska Department of Labor that could lead to increased subsistence harvests by residents of this subregion and the possibility of increased competition between communities in the Kuskokwim drainage for highly-valued resources such as Chinook salmon and moose. The extent to which subsistence harvests increase may be moderated by other factors.

Changes in the Cultural Composition of a Community

Increased employment opportunities offered by the mine may also have an effect on community populations through the in-migration of new residents, and changes in the cultural composition, or percentage of Alaska Natives and non-Natives in a community. Such changes could potentially affect subsistence food harvest levels within a community. Statistically, communities with larger non-Native populations have lower subsistence harvest levels (Wolfe et al. 2011).

Local residents also recognize that in-migration by non-locals could affect the cultural context of subsistence activities.

> *People that come and choose to adapt to the way of life that is being conducted within the villages are most welcome if they choose to do that. But those who see it and treat it as just a recreational opportunity, and just the way they treat the animals, like the way they throw fish around, they don't have the appreciation. It's great fun and it's something we should all be able to do* [hunting and fishing].

> *But anyway, that's really what's at the heart of it is how people use and respect the animals and do they come and adapt to the community and not look to have the community change to accommodate their ways. And that applies as much in the personal sense as in the larger sense of mines and economic development and the whole economic structure, I guess, if you will, and the -- the way of life that's centered around money versus living with the -- within a natural world you were born with and being a part of that world. That's all we are trying to do there. It's a difficult one* (Greg Roczicka, URS 2013c).

The effects of historical in-migration and employment opportunities on the cultural composition of key regional communities is reflected in current populations of communities such as McGrath (54 percent Alaska Native), Aniak (73 percent Alaska Native), and Bethel (68 percent Alaska Native), while many of the smaller communities have Alaska Native populations exceeding 90 percent.

The likely effects of in-migration by non-Alaska Natives associated with employment at the proposed Donlin Gold Project are examined below. The enclave policy of the proposed mine would likely limit the numbers of in-migrants who take up residency in communities within the region.

Changes in Employment and Incomes

In the early 1980s, Alaska researchers began documenting the inter-relationship of the cash economy and subsistence production. Many studies revealed a strong correlation between success in the wage sector and success in the subsistence sector; a healthy wage sector can support a healthy subsistence sector in rural areas of the state (Kruse 1979; Wolfe et al. 2010). Other statistical analyses found that communities with higher average incomes had lower rates of subsistence food production (Wolfe and Walker 1987; Wolfe et al. 2011).

The effect of income on subsistence production is particularly pronounced among households with distinctive demographic structures. Research has found that in many communities 30 percent of households produce 70 percent of the subsistence harvest. These "super households" are distinctive because they include multiple working-age males, have high incomes, and are often involved in commercial fishing. These three factors enable high producing households to combine subsistence activities with paid employment and to deploy considerable labor in flexible ways to maximize harvests, which they then share with other households in the community. By contrast, low producing households usually have low incomes, are led by a single female or non-Native head of household, are single-person households, or households composed of elders (Wolfe et al. 2010).

The relationship between higher incomes and increased subsistence production was corroborated during the two workshop meetings and the interviews conducted by the EIS Team (URS 2013c, 2014e; AECOM 2015a). Local residents reported that participation in subsistence activities varied among households and that for many households the recent and rapid increases in the cost of gas, combined with declining availability of jobs in the smaller villages, have made it harder for residents to pursue the full seasonal round of subsistence activities. They also thought that these declines could be offset by employment opportunities at the mine that would enable people to invest in subsistence equipment and operating costs. Furthermore they thought these investments could partially offset limitations of work schedules for shift workers, allowing the employees to conduct their subsistence harvest activities more efficiently.

Changes in income created by employment in the mine may have indirect effects on subsistence food harvests, depending on how families and individuals choose to spend their incomes. If families such as the super households described above continue to invest in new equipment, and more marginal households also invest in subsistence activities, then subsistence harvest could be expected to increase. More efficient technology would compensate for the time away for employment shifts at the proposed mine by enabling subsistence users to obtain subsistence foods in a shorter time (Kruse 1979). More reliable or increased subsistence production by high-producing households may maintain or increase the sharing of subsistence products along traditional networks, especially to elders, single-mother households, and the infirm. Sharing supports community well-being and reinforces traditional values.

While some households may choose to invest in subsistence, others may not. Instead these households could choose to use the larger incomes to purchase more commercial food following current, on-going changes in food tastes. In this case, subsistence harvests could decline or remain flat. Purchases of commercial foods may increase if subsistence fish stocks (like Chinook salmon) and game populations (moose) remain low and if harvests of salmon and moose continue to be low, despite more efficient equipment to pursue them. A corollary to the increased purchase of store food includes health problems such diabetes.

Another consequence of more efficient equipment is that hunters are able to quickly travel long distances and increase their hunting areas. If hunters are able to increase their hunting areas, this could increase the potential for competition for such scarce resources as salmon and moose between residents of subregions and local communities. In turn, this may result in more time spent working with regulatory agencies to resolve between-community competition.

Remote Industrial Enclave and Commuting

Several Canadian and international studies concluded that large-scale mining operations often share some common employment and income characteristics that can affect subsistence harvests (Gibson and Klinck 2005). When a mine is remotely located, away from existing communities, workers commute from their homes for their work shift. This has several important implications. Since the mining company provides transportation to the mine, workers may travel from local communities, regional hubs, or more distant cities without cost to the employee. Some local residents working at the mine may choose to leave the region and establish households elsewhere. According to testimony in Scoping meetings for the Donlin Gold EIS, this has already occurred, and local communities are concerned about this potential effect. If a large proportion of young men and male heads of mature households (i.e., those most likely to contribute to high harvesting households) were to relocate to urban centers, this could affect the configuration of labor within family groups, overall community subsistence production, and sharing of subsistence foods.

Remote mine site enclaves have other characteristics that influence socio-cultural impacts. Enclave-based employment minimizes the direct demographic changes in nearby communities. The proposed Donlin Gold mine site is a self-contained industrial worksite, not a new community. Families do not accompany workers, and the mine workforce does not generally create new demands on local or regional housing, education, and health care infrastructure. Since non-local workers can commute to the worksite, there is less of a tendency for non-local workers to move to the region of the mine. In Alaska, the industrial enclave policies typically prohibit workers from hunting and fishing from the work site, minimizing concerns about competition for local fish and game resources. While mine site policies can minimize competition by employees, there are other potential sources of competition indirectly associated with the project, as discussed below.

Rotational Work Schedules and Year-round Employment

Rotational work schedules could affect subsistence production and the social dynamics of households and communities. Subsistence is labor intensive with the harvest and processing of food traditionally organized with distinctive roles for men and women, elders, middle aged-adults, and young people. Shift patterns of employment at the mine would result in the periodic absence of men and women who are involved in subsistence. Year-round work shifts instead of seasonal employment may affect the ability of hunters to spend long periods on the land resulting in the loss of skills and traditional knowledge.

Employed family members may have less time available to hunt and fish, and less flexibility in scheduling to hunt and fish, particularly if regulatory restrictions limit the windows for hunting or fishing. The absence of key family members may also affect the training and practice in harvesting for younger family members. Families commonly make adjustments in labor in subsistence production, but it would be a challenge, and in some cases could lead to stress and

tension which could result in social problems or increased out-migration. Adjustments to compensate for the absence of family members include:

- Specialization of subsistence production, with non-employed members doing more fishing and hunting, training younger kin-group members, and sharing with employed family members.
- Further changing in gender roles, with women doing more hunting or fishing, and/or men doing more processing.
- Specialization of wage employment by some members of the community.

Taken together, these studies suggest five categories of socio-cultural impact for analysis:

- Availability of employment can affect the population size and cultural composition of local communities and indirectly affect the harvest of subsistence resources;
- Increased incomes can positively or negatively affect subsistence activities; people can choose to purchase new equipment to more effectively hunt, gather, and fish, or use their money to purchase store food;
- Occupationally-defined work enclaves with transportation that allows workers to live anywhere may encourage the formation of new households within the local communities, or encourage regional out-migration so that communities lose their most productive hunters/fishers and affect the configuration of labor within family groups;
- Rotational work schedules can provide flexibility for subsistence pursuits or interfere with established seasonal subsistence patterns and culturally defined work roles, within family groups; and
- Year-round work shifts instead of seasonal employment may affect the ability of hunters to spend long periods on the land resulting in the loss of skills and traditional knowledge, or they may also provide hunters with predictable schedules to effectively plan their subsistence activities and use that time to share their skills and traditional knowledge with their families.

3.21.6.1.4 IMPACT CRITERIA FOR RATING EFFECTS ON SUBSISTENCE

The following table provides narrative descriptions of the rating scale for impacts, addressing the four factors of magnitude/intensity, duration, geographic extent, and context. Scales are provided for each of the major impact types to be analyzed in this section. Note that the scale implicitly includes a No Impact rating, though this is rarely used.

Table 3.21-22: Impact Criteria for Effects on Subsistence

Type of Effect	Impact Component	Effects Summary		
Effects due to Changes in Resource Abundance and Availability	Magnitude or Intensity	**Low**: Changes necessitate small adjustments in harvest pattern. Alternative resources readily available at low cost (increase of less than 10%) and effort, allowing negligible change in overall harvest success (less than 10% reduction).	**Medium**: Changes require adjustments affecting high productivity subsistence resources or more than one seasonal pattern. Alternative resources available at moderate cost (increase of up to 25%) and effort, which may result minor (up to 25%) declines in overall harvest success.	**High**: Changes necessitate large-scale changes affecting high productivity resources or harvest practices through multiple seasons of the year. Alternative resources unavailable or available only at high cost and effort, resulting in moderate to major declines (greater than 25%) in overall harvest success.
	Duration	**Temporary**: Changes in use patterns for the duration of project construction (3-4 years).	**Long-term**: Changes in use patterns for the life of the project (30 years).	**Permanent**: Changes in use patterns would extend beyond the life of the project.
	Geographic Extent	**Local**: Effects realized by communities within a subregion, such as the Upper Kuskokwim, Central Kuskokwim, etc.	**Regional**: Effects realized by communities across subregions or throughout the EIS Analysis Area.	**Extended**: Effects realized throughout the EIS Analysis Area and may extend beyond the EIS Analysis Area.
	Context	**Common**: Affects harvest of locally abundant subsistence resources.	**Important**: Affects harvest of high volume or highly valued subsistence resources which may be subject to strong conservation measures or for which alternatives are not readily available.	**Unique**: Affects subsistence resources that are of high cultural importance which cannot be efficiently replaced.

Table 3.21-22: Impact Criteria for Effects on Subsistence

Type of Effect	Impact Component	Effects Summary		
Effects Due to Changes in Access	Magnitude or Intensity	**Low**: Changes disturb or displace access limited to small portions (less than 10% if measurable) of the subsistence use area for generally abundant resources. Access to alternative areas readily available at low cost (increase of less than 10%) and effort.	**Medium**: Changes disturb or displace access to a moderate level portion (i.e., up to 25%) of the subsistence use area. Access to alternative areas available at moderate cost (increase of up to 25%) and effort.	**High**: Changes displace effective access to a large portion (greater than 25%) of subsistence use area. Access to alternative areas available at high cost (increase of greater than 25%) and effort.
	Duration	Same as for Subsistence Resources		
	Geographic Extent	Same as for Subsistence Resources		
	Context	**Common**: Affects access to localized areas supporting harvest of abundant resources.	**Important**: Affects access to areas supporting harvest of high volume or highly valued subsistence resources.	**Unique**: Affects access to areas supporting harvest of subsistence resources that are very difficult to replace in productivity or cultural importance.
Effects Due to Changes in Competition	Magnitude or Intensity	**Low**: Changes in competition for generally abundant resources, resulting in negligible reduction in overall harvest success (less than 10%).	**Medium**: Changes in competition for resources in limited abundance, resulting in moderate reduction in harvest success (up to 25%).	**High**: Severe changes in competition for resources in limited abundance, resulting in large reductions in harvest success (greater than 25%).
	Duration	Same as for Subsistence Resources		
	Geographic Extent	Same as for Subsistence Resources		
	Context	**Common**: Competition affecting use of abundant resources.	**Important**: Competition affecting use of resources without readily available alternatives.	**Unique**: Competition affecting uses with no available alternatives.

Table 3.21-22: Impact Criteria for Effects on Subsistence

Type of Effect	Impact Component	Effects Summary		
Socio-cultural Effects on Subsistence Income, Out-migration, Work Schedule Conflicts	Magnitude or Intensity	**Low**: Socio-cultural changes affect a small proportion of households (less than 10%), and/or result in small reductions (less than 10%) in participation of households in seasonal round of subsistence activities.	**Medium**: Socio-cultural changes affect a small proportion of households (up to 25%), and/or result in moderate reductions (up to 25%) in participation of households in seasonal round of subsistence activities.	**High**: Socio-cultural changes affect a large proportion of households (greater than 25%), and/or result in large reductions (greater than 25%) in participation of households in seasonal round of subsistence activities.
	Duration	Same as for Subsistence Resources		
	Geographic Extent	Same as for Subsistence Resources		
	Context	**Unique**: Rural subsistence practices on federally managed lands and waters are recognized and protected in law (Title VIII of ANILCA). In addition, these culturally distinct, subsistence-based social groups are very rare in the US, resulting in a rating of unique.		

3.21.6.2 ALTERNATIVE 1 – NO ACTION

3.21.6.2.1 EFFECTS FROM CHANGES IN SUBSISTENCE RESOURCES, ACCESS, AND COMPETITION

Under the No Action Alternative, the proposed Donlin Gold Project would not receive permits, and Donlin Gold would not establish a mine site, develop transportation facilities or construct a natural gas pipeline in the EIS Analysis Area. Subsistence resources that had been displaced during the exploration and baseline studies period would likely reoccupy the mine site area, and subsistence users from Crooked Creek may reestablish their use of the area. There would be no increase in competition from non-local residents for subsistence resources.

Alternative 1 would have no effect on climate change in the EIS Analysis Area, as related to subsistence. Existing trends in climate change, described in Section 3.26 would continue.

3.21.6.2.2 EFFECTS FROM CHANGES IN SOCIO-CULTURAL ASPECTS OF SUBSISTENCE

If the Donlin Gold Project is not authorized, then the local employment associated with exploration and environmental studies of recent years would not continue. This action would result in a near-term decrease in the number of jobs available in the region, and would have an indirect effect on Calista shareholders since the advance royalties that Donlin Gold pays to

Calista Corporation would be terminated (see Section 3.18.2.1.1, Socioeconomics). The loss of jobs would likely not be easily offset and could result in some families leaving the region, continuing a recent trend (Section 3.18.2.1.1, Socioeconomics).

While communities would continue to have subsistence-based economies, the loss of this source of employment could lead to less available income to purchase fuel or ammunition, and this may cause community residents to reduce their subsistence activities. Many residents have stated that subsistence activities are currently constrained by the high cost of fuel in particular. However, to the extent that seasonal work at the Donlin exploration camp has reduced labor and time available for subsistence, then loss of this seasonal work would increase labor and time available for subsistence activities. The loss of income could contribute to increased subsistence activities because there would be less money available to purchase non-subsistence food. Families may adapt their harvest practices to concentrate on resources that can be harvested with relatively little cost. For some families, the loss of this income may result in relocation to areas with more work available, and the related reduction of subsistence production for their home community.

The No Action alternative would result in effects to the economic and socio-cultural aspects of subsistence that are low intensity and permanent in duration. Since most of the current workforce is drawn from communities within the region, effects would be regional in extent and affecting subsistence practices that are unique in context, based on the high value placed on this way of life by local residents.

3.21.6.2.3 SUMMARY OF IMPACTS – ALTERNATIVE 1

Under the No Action Alternative the Donlin Gold Project would not occur and the summary effect to subsistence activities would be negligible. Without disturbance at the site, habitat would recover and wildlife would reoccupy the area, providing the basis for subsistence harvests to be re-established in the mine site area. These are minor positive effects on subsistence resources and access. There would be no direct effect to competition for subsistence resources. Potential effects to socio-cultural aspects of subsistence would be of low intensity (including both loss of income and greater availability of labor and time for subsistence activities), permanent in duration, regional in extent, and affecting subsistence practices that are unique in context. With minor or negligible direct or indirect effects, this alternative would have a minor contribution to cumulative effects on subsistence uses.

3.21.6.3 ALTERNATIVE 2 – DONLIN GOLD'S PROPOSED ACTION

3.21.6.3.1 MINE SITE

<u>Effects from Changes in Subsistence Resources (Construction, and Operations and Maintenance)</u>

Under Alternative 2, the construction and operation of the mine site would result in on-going direct impacts to subsistence resources and harvest practices of four types: habitat loss at the mine site, displacement of animals from heavy equipment and noise in the immediate vicinity of the mine; fugitive dust deposits on plants used for subsistence, and perceived contamination of waterfowl in the TSF, pit lake and other water retention structures. Localized habitat loss and

displacement of black bears and fur bearing animals[7] in the vicinity of the proposed mine site has been observed by local residents during the 16 years of exploration and baseline studies, and it is likely that construction or build-out of the major facilities at the mine site would further displace some local animal populations. Fugitive dust from the mine construction and operations has the potential to be deposited on berries near the mine site, which would make subsistence users wary about harvesting this resource. However, most berrypicking by residents of Crooked Creek takes place in a large area away from the mine site. In Section 3.10.3.2, Vegetation, fugitive dust impacts to plants were rated as low to medium intensity, while Section 3.2, Soils, noted that fugitive dust remains largely within the mine site.

Potential impacts to subsistence use of waterfowl could result from perceived contamination of waterfowl as they utilize standing water components at the mine site, such as the TSF. As noted in Section 3.12.5.2.2, Wildlife, in the subsection addressing Birds, the standing waterbodies would have varying levels of contamination (inorganic constituents), with the TSF likely to have higher concentrations of antimony, arsenic, and selenium than the pit lake. The TSF would be characterized by on-going mining activity during operations, and would be unlikely to support growth of vegetation or invertebrates that might serve as food sources for waterfowl. Without food sources, waterfowl are unlikely to stay long in the TSF. In all, migratory waterfowl are not expected to be at risk from ingestion of toxic water, food or sediment at the water storage features. Communication with subsistence users about the ecological risks and waterfowl exposure to contamination is important; to convey accurate information and to address concerns and perceptions about contamination.

Potential impacts to subsistence fish resources, including both salmon and non-salmon species, could result from habitat removal (in-stream, and wetland and riparian buffers) and fish losses, as well as changes in streamflow, stream temperature, and stream sedimentation. Construction and operation of the mine would directly remove or modify habitat and reduce stream flow from American Creek (4.09 stream miles lost), Anaconda Creek (1.53 stream miles lost), Lewis Gulch (2.31 stream miles lost), and Snow Gulch (0.05 stream miles lost) in the middle to upper reaches of the Crooked Creek drainage. Taken together this would represent the loss of 8 miles of perennial stream habitat, of which 0.66 miles is classified as anadromous and the remainder is non-anadromous. (For additional details, see Table 3.13-26 and associated discussion in Section 3.13, Fish and Aquatic Resources.) Omega Gulch would be affected by mine water management practices. Section 3.13, Fish and Aquatic Resources, concluded that

> The geographic extent of impacts associated with flow reductions and aquatic habitat alterations in the Crooked Creek mainstem would primarily extend from the confluence of Queen Gulch to below Anaconda Creek. The impact intensity in the lower reaches of Crooked Creek and in the Kuskokwim River would be low due to substantial inflows from undisturbed Getmuna and Bell creek drainages. Impacts on surface flows in the affected tributaries and in the middle reaches of Crooked Creek would be permanent, extending beyond the life of the project…. [M]inor impacts are expected downstream in lower Crooked Creek. Under a High K scenario [referring to high hydraulic conductivity

[7] Fur bearing mammals, taken by trapping, are also referred to as small land mammals in the ADF&G's Division of Subsistence studies. These include beaver, fox, and American or pine marten. For ease of reading, this group of subsistence resources will be referred to as fur-bearing animals in this section.

> of the bedrock aquifer], impacts to fish and aquatic habitat in the middle and lower reaches of Crooked Creek would be major.

Regarding the distribution of salmon spawning redds in the Crooked Creek, Section 3.13 Fish and Aquatic Resources noted the concentration in the lower reaches of Crooked Creek:

> Based on aerial surveys of spawning adult salmon conducted from 2004 to 2010, an annual average of about 350 salmon have been observed in the mainstem of Crooked Creek with 88 percent of the observations occurring between Crevice Creek and the Kuskokwim River where flow reductions from mine operations and closure would be minor. Over this same period in the middle reaches of Crooked Creek upstream from Crevice Creek, an annual average of 40 adult salmon (12 percent of the total) were observed primarily consisting of coho and chum.

Considering all impact factors, direct and indirect effects of the mine site on fish and aquatic resources in the Crooked Creek drainage would be moderate to major in the middle reaches and minor in the lower reaches of Crooked Creek (i.e., below Crevice Creek). Getmuna Creek and Bell Creek and the lower reaches of Crooked Creek, where most adult salmon escapement and production in the drainage occurs, would experience negligible impacts.

Impacts of habitat loss and displacement of bears and fur-bearing animals, and any potential impact to berry resources due to fugitive dust at the mine site, would primarily affect Crooked Creek residents since this is the only community with a contemporary subsistence use area that extends to the vicinity of the mine site (see Figure 3.21-16 and Figure 3.21-51). Lower Kuskokwim River villages do not use the Crooked Creek drainage for large mammals harvests (Figure 3.21-52). To place the effects on subsistence resources and displacement of access in perspective, the mine site and associated area of disturbance represents approximately 25 square miles, while the Crooked Creek subsistence use area was mapped in 2009 as extending to 1,246 square miles with no overlap with the mine site. (For discussion of overlap between the Crooked Creek use area and the Angyaruaq [Jungjuk] Port site, see Section 3.21.6.3.2.)

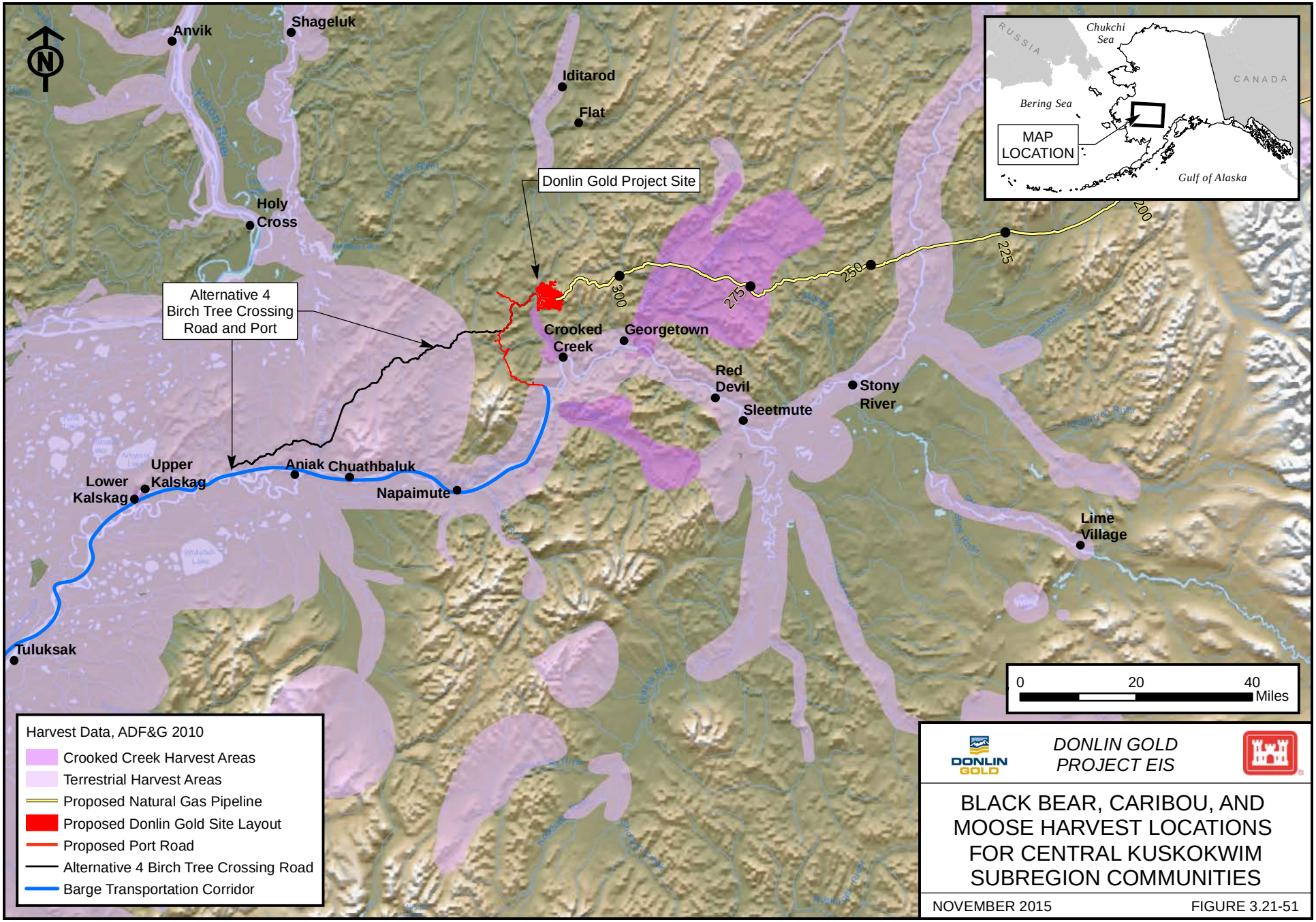
The direct impacts due to changes in subsistence resources at the mine site would be of low intensity for Crooked Creek residents, given the very limited impacts to plant, bear, fur bearer and fish subsistence resources in the Crooked Creek use area overlapping or adjacent to the mine site. Adjustments to the seasonal round would be minor and alternative resources are readily available. No other Central Kuskokwim River communities have areas overlapping with the mine site. Indirect impacts of low intensity are also likely in regard to perceived risk of contamination of waterfowl in mine site water features, such as the TSF and eventual pit lake. These impacts to Crooked Creek harvest practices would be long-term, lasting the life of the mine, except that indirect harvest impacts on the Bering Sea Coast due to perceived contamination of waterfowl in the pit lake would be permanent, corresponding to the life of the pit lake. These impacts would be local in extent in the vicinity of the mine site, except for the harvest changes due to perceived waterfowl contamination, which would be regional in extent. These impacts would affect resources that are generally common in context, except for Chinook salmon and migratory waterfowl, which would be important in context because of the urgent conservation measures implemented in recent years, and protection under the MBTA.

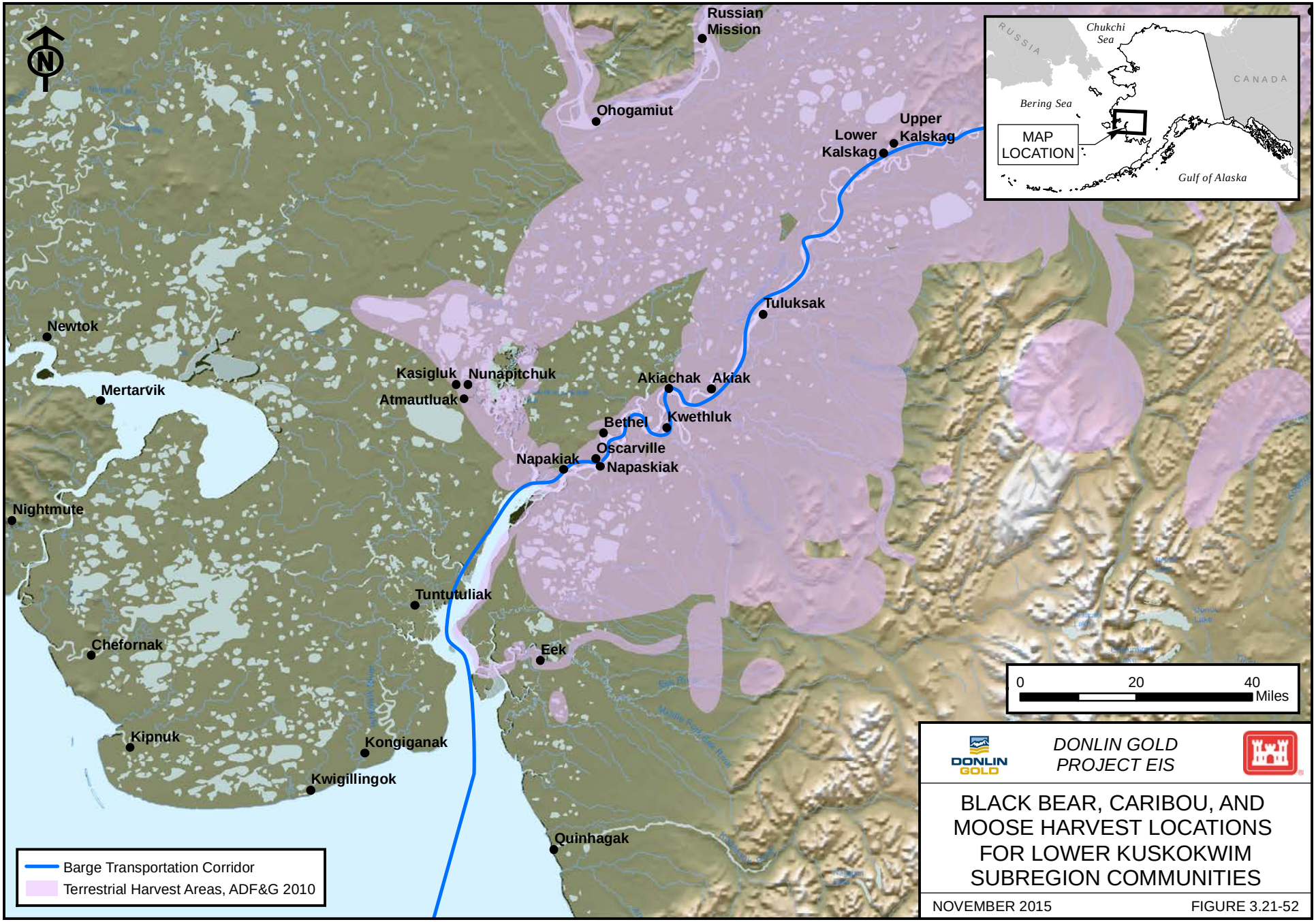
Effects from Changes in Subsistence Resources (Closure, Reclamation, and Monitoring)

After closure of the mine site under Alternative 2, active mining would cease and the mine site reclaimed, substantially reducing the effects on subsistence harvests due to changes resources and habitats. The mine site would slowly revegetate and return to a more natural state regaining value as habitat for several subsistence species such as moose and black bear and fur-bearing animals (Section 3.12.3, Wildlife). At closure, the TSF would be drained of water, and both the TSF and WRF would be recontoured with reserved topsoil, and revegetated.

The pit lake would fill over an estimated 50 years. The reclamation plan calls for perpetual operation of a water treatment plant to treat pit water to meet water quality standards for discharge into Crooked Creek below Omega Gulch between the confluence of American Creek and Anaconda Creek. Compliance monitoring would assure that water quality standards are maintained to minimize impacts to fish and aquatic resources. Water temperature changes associated with pit lake treated water discharges during summer would result in minor to moderate impacts in the middle reaches of Crooked Creek and minor in the lower reaches below Crevice Creek. The pit lake would become a new area of standing water that could attract wildlife and migratory birds. Wildlife species and birds are not expected to be at risk from ingestion of surface water from the pit lake (Section 3.12.3, Wildlife and Section 3.12.5, Wildlife, Birds).

Closure and reclamation of the mine site would have positive impacts on habitat and wildlife of low to medium intensity, as these would be noticeable. Without the disturbance of the mine operation, and with revegetation of the main features of the mine, wildlife such as bears and furbearers are likely to reoccupy the mine site. After 50 years, when the pit lake fills, the discharge of treated pit water would increase streamflow in Crooked Creek, with minor seasonal water temperature increases in the lower reaches where most salmon spawning occurs. The pit lake would introduce a new standing water structure, but changes in waterfowl resources would not be noticeable. These changes are considered permanent in duration, local in geographic extent, and affect resources that are common in context, except for waterfowl that are important in context, due to protection under the Migratory Bird Treaty Act. The subsistence practices affected would be unique in context.


Anvik
Shageluk
Iditarod
Flat
Holy Cross
Donlin Gold Project Site
Alternative 4 Birch Tree Crossing Road and Port
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
Lime Village
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napaimute
Tuluksak
200
225
250
275
300
RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
0
20
40
Miles
Harvest Data, ADF&G 2010
Crooked Creek Harvest Areas
Terrestrial Harvest Areas
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
Alternative 4 Birch Tree Crossing Road
Barge Transportation Corridor
DONLIN GOLD
DONLIN GOLD PROJECT EIS
BLACK BEAR, CARIBOU, AND MOOSE HARVEST LOCATIONS FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-51


Russian Mission
Ohogamiut
Upper Kalskag
Lower Kalskag
Tuluksak
Newtok
Mertarvik
Kasigluk
Nunapitchuk
Atmautluak
Akiachak
Akiak
Bethel
Kwethluk
Oscarville
Napakiak
Napaskiak
Nightmute
Tuntutuliak
Eek
Chefornak
Kipnuk
Kongiganak
Kwigillingok
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N
RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
0
20
40
Miles
Barge Transportation Corridor
Terrestrial Harvest Areas, ADF&G 2010
DONLIN GOLD
DONLIN GOLD PROJECT EIS
BLACK BEAR, CARIBOU, AND MOOSE HARVEST LOCATIONS FOR LOWER KUSKOKWIM SUBREGION COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-52

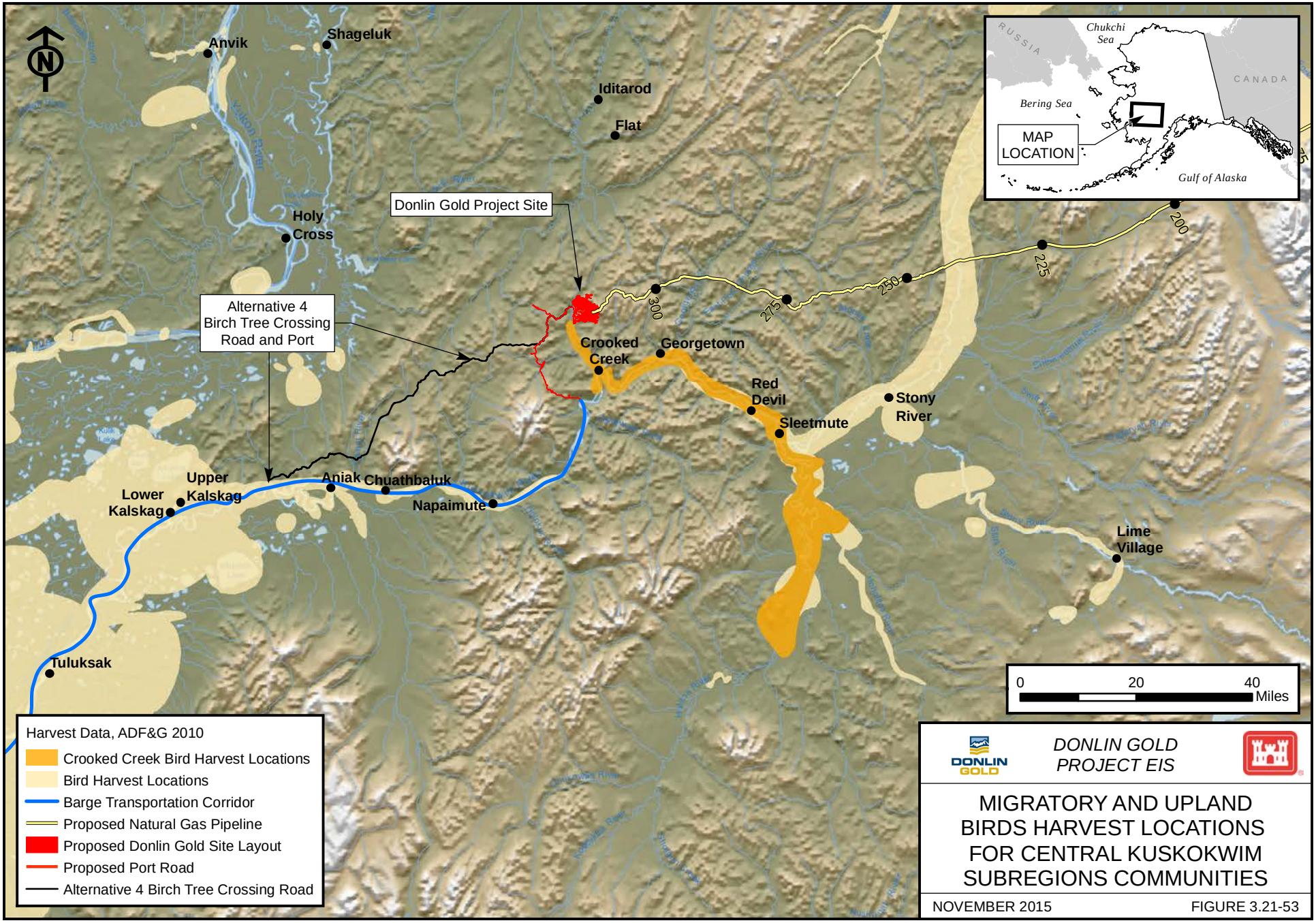
Effects from Changes in Access to Subsistence Resources (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

Impacts on access to subsistence resources can include legal barriers such as trespass prohibitions, or physical barriers such as fencing off lands to block access by other users. Displacement of subsistence use areas due to disturbance can also be considered an impact to access to subsistence resources, in that subsistence users would have to compensate by going to other areas to maintain their subsistence uses and needs.

Under Alternative 2, operation and construction of the mine site would restrict access to subsistence resources and use areas in a limited area. Subsistence access to the mine site vicinity has included foot and snowmachine travel. Subsistence use area maps for the period 1964 through 1986 showed that Aniak and Crooked Creek residents trapped along the Crooked Creek riparian corridor, including tributaries downstream and to the west of the proposed Donlin Gold mine site (Brelsford et al. 1987, adapted in Figure 4.14-1 in ARCADIS 2013a). During scoping meetings, local residents reported they reduced their use of this area during the summer exploration and baseline study programs over the past 16 years. Access and subsistence hunting at the mine site would be prohibited during construction and operations for safety reasons.

Limitations on access and displacement of subsistence activities would primarily affect the community of Crooked Creek, since the mine site falls within or adjacent to a portion of the village's contemporary subsistence use area (see Figure 3.21-16 and Figure 3.21-17 above). The subsistence use areas of other villages within the EIS Analysis Area do not generally overlap with the mine site (see Figure 3.21-51 and Figure 3.21-52 above for large mammal harvest areas of the Central Kuskokwim River and Lower Kuskokwim River villages respectively). The contemporary subsistence use area for all species for Crooked Creek residents, as documented in 2009 (Brown et al. 2012), extends along the Kuskokwim River in a fairly narrow corridor from the vicinity of Lower Kalskag to approximately Sleetmute. Harvest activities extend in larger areas up the key tributaries of the Oskawalik River, the George River, and the Holitna River (see Figure 3.21-53 and Figure 3.21-54 for bird and vegetation harvest areas for the Central Kuskokwim River villages).

An extensive area around Crooked Creek village is also used, with smaller corridors up Crooked Creek itself to the approximate vicinity of the mine site, as well as Getmuna Creek and Bell Creek. The estimated total area of the Crooked Creek subsistence use area in 2009 was 1,245.9 square miles (Brown et al. 2012). This contemporary mapped use area does not overlap with the proposed mine site, however Crooked Creek residents report that in previous decades they did hunt, trap, and pick berries in the vicinity of the mine site. In addition, Crooked Creek residents traveled up the drainage beyond the mine site continuing on to the Yukon River drainage and Flat, primarily for trapping (David John, cited in URS 2014d).


Anvik
Shageluk
Iditarod
Flat
Holy Cross
Donlin Gold Project Site
Alternative 4 Birch Tree Crossing Road and Port
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
Lime Village
Upper Kalskag
Lower Kalskag
Aniak
Chuathbaluk
Napaimute
Tuluksak
200
225
250
275
300
MAP LOCATION
Chukchi Sea
Bering Sea
Gulf of Alaska
RUSSIA
CANADA
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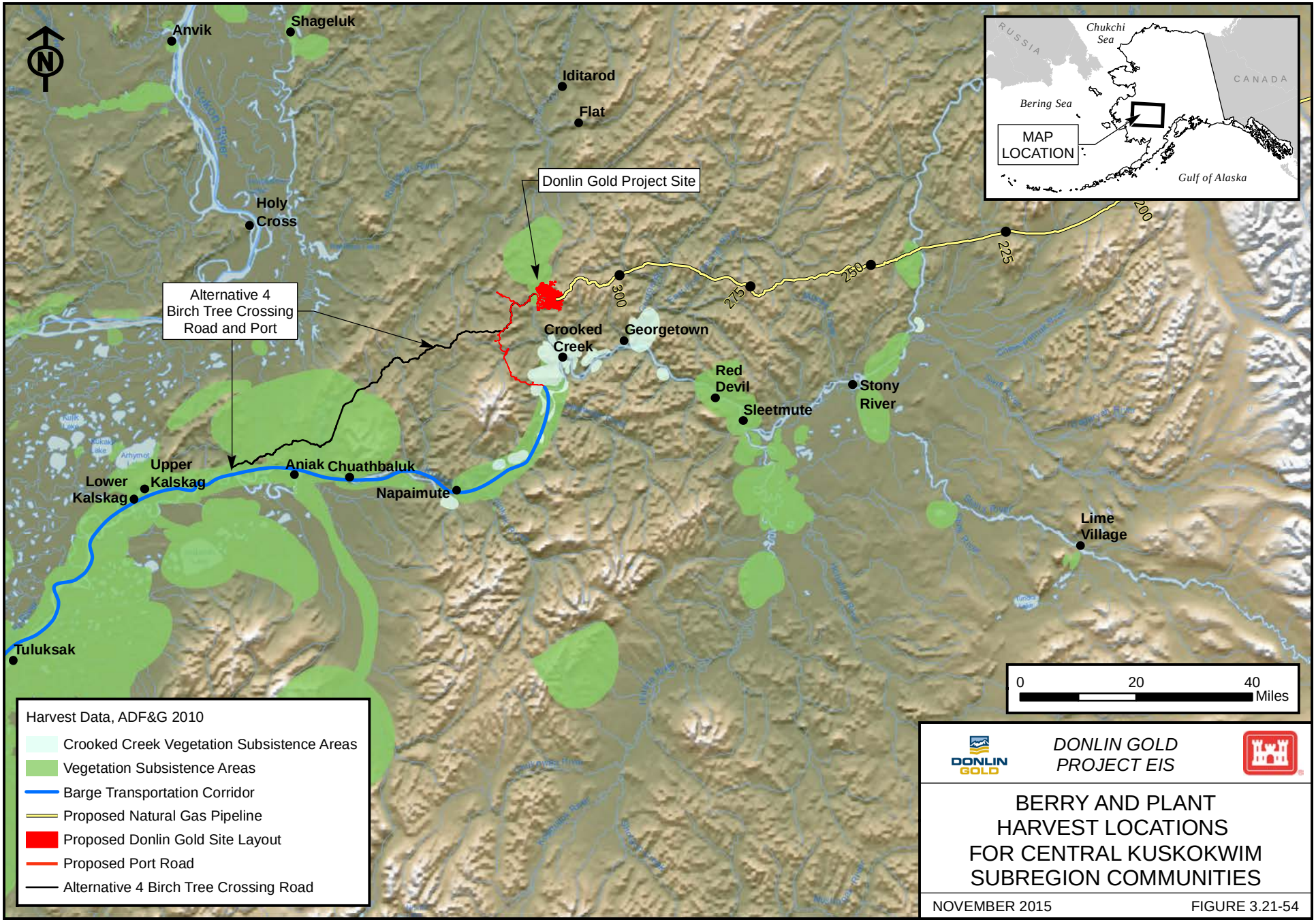
20
40
Miles
Harvest Data, ADF&G 2010
Crooked Creek Bird Harvest Locations
Bird Harvest Locations
Barge Transportation Corridor
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
Alternative 4 Birch Tree Crossing Road
DONLIN GOLD
DONLIN GOLD PROJECT EIS
MIGRATORY AND UPLAND BIRDS HARVEST LOCATIONS FOR CENTRAL KUSKOKWIM SUBREGIONS COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-53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Aniak
Chuathbaluk
Napaimute
Tuluksak
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Chukchi Sea
RUSSIA
CANADA
Bering Sea
MAP LOCATION
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Harvest Data, ADF&G 2010
Crooked Creek Vegetation Subsistence Areas
Vegetation Subsistence Areas
Barge Transportation Corridor
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
Alternative 4 Birch Tree Crossing Road
DONLIN GOLD
DONLIN GOLD PROJECT EIS
BERRY AND PLANT HARVEST LOCATIONS FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-54

Within the overall subsistence use area for Crooked Creek residents, there are subareas focused on particular hunting and fishing activities. The black bear hunting and harvest areas mapped in 2009 extend up the Crooked Creek drainage to a point above the proposed mine site, while moose hunting is concentrated on the mainstem of the Kuskokwim River, and in the Oskawalik and George River drainages. The 2009 map of use areas for fur-bearing animals includes a 3- to 5-mile reach of Crooked Creek in the vicinity of the proposed mine site, and another small zone in the upper reach of Bell Creek. Ducks and geese are harvested up Crooked Creek to a point above the proposed mine site. Berries and greens are taken in a zone around the community extending up the Crooked Creek drainage to approximately the mouth of the Getmuna Creek (Figure 3.21-16 above). For impacts to Crooked Creek subsistence fishing, see the discussion under Transportation Infrastructure below. The more specific map of the 2009 subsistence use area for fishing indicates that the lower reach of the Crooked Creek drainage is used for salmon fishing to a point below the proposed mine site at Bell Creek (Figure 3.21-56).

In all, the proposed mine site would represent about 25 square miles of industrial activity and would cause displacement of subsistence activities adjacent to the reported 2009 subsistence use area in the Crooked Creek drainage. Contemporary subsistence uses in the vicinity of the mine site, but not directly in that area include bear hunting, trapping, hunting for duck and geese, and use of berries. Other portions of the contemporary subsistence use area support the majority of subsistence hunting and food production. For example, subsistence fishing which accounted for 81 percent of subsistence food in 2009 occurred outside of the mine site vicinity. Compared to several decades ago, residents report that the seasonal mine exploration camp has already resulted in redirecting subsistence activities efforts away from the site. As indicated by Crooked Creek residents, traditional subsistence resources such as black bear have already been affected by existing exploration and baseline study activity at the Donlin Gold camp. While Crooked Creek residents have already redirected their subsistence use area, construction and operation of the proposed mine site would intensify this pattern and extend it for nearly 30 years. The disturbance from a seasonal camp during the exploration period would become year-round, and the 30-year period would extend across a generation, limiting the opportunities for elders who formerly hunted and trapped in this particular portion of the Crooked Creek subsistence use area to mentor younger people in this location.

Access to subsistence resources would be prohibited within the mine site - a small portion of the Crooked Creek subsistence use area; the impacts would be of high intensity but in a small, localized geographic extent.

During the closure phase, access to the mine site would be allowed once the reclamation process was complete. As a result, access to subsistence resources would again become possible at the mine site (a water treatment plant would be installed adjacent to the pit lake an estimated 50 years after closure, when the pit lake is full).

Effects of changes in access to the mine site would be limited to about 25 square miles adjacent to the contemporary Crooked Creek subsistence use area, estimated to be 1,245 square miles. The subsistence use areas of other communities in the Central Kuskokwim would be unaffected by the mine site. Given the proportion of the subsistence use area affected, the seasonal round of subsistence uses by Crooked Creek would continue, with limited geographic displacement away from the mine site. Duration, extent and context would be the same as for effects due to changes in subsistence resources.

Effects from Changes in Competition for Subsistence Resources (Construction; Operations and Maintenance; and Closure, Reclamation and Monitoring)

The Donlin Gold Project would result in new employment including some non-local employees, but this would likely result in very little additional competition for subsistence resources as a result of several factors. First, Donlin Gold would prohibit participation in subsistence harvest activities by employees and contractors while they are on shift during all phases of the project. Donlin Gold would also prioritize hiring shareholders from the land-owning ANCSA Corporations (Calista and The Kuskokwim Corporation). Section 3.18, Socioeconomics, estimates that 50-60 percent of the workforce of 3,200 workers during construction and 1,000 workers during operations, would come from the Yukon Kuskokwim region. Particularly during construction, the temporary, non-local workers are likely to commute from their homes outside of the region, and it would be unlikely that the construction phase would result in an influx of new residents to the local communities of the EIS Analysis Area. During the operations phase, most non-local employees are likely to continue to commute to the worksite. A small number of non-local employees may find the region to be attractive, and they may establish households in the EIS Analysis Area – most likely in Aniak or Bethel.

In-region competition for scarce subsistence resources could also be indirectly affected by the proposed Donlin Gold Project. These effects would not be concentrated at the mine site, but would extend throughout the Kuskokwim River drainage. From the late 1960s to the early 2000s, Central Kuskokwim residents objected to growing competition from Lower Kuskokwim River residents, who used large boats to come in large numbers to hunt on the Holitna and Hoholitna rivers in Unit 19A. The Board of Game responded in the late 1980s by limiting the size of boat motors (i.e., 40 horsepower or less) that could be used in moose hunting on these tributaries. When the moose population declined precipitously, a moratorium on moose hunting in Unit 19A was adopted in the last decade. Lower Kuskokwim River communities generally redirected their moose hunting to the Lower Kuskokwim or Lower Yukon rivers. Concerns over conservation and allocation of Chinook salmon on the Kuskokwim River also saw differences from the 1980s to the present between Lower Kuskokwim River communities generally favoring larger harvest allocations, while Central Kuskokwim River communities advocated for larger escapements to provide for fishing opportunity in their subregion. By 2014, the Chinook salmon decline on the Kuskokwim River led to the most conservative subsistence fishing management approach ever for this highly valued resource.

Competition for these resources has been the result of a complex mix of changes in income (i.e., the growth in commercial fishing and adoption of bigger boats and motors) and ecological conditions. Recovery of moose populations in Unit 19 is likely in coming decades, while the future trend for Kuskokwim River Chinook salmon is uncertain. No specific estimates on the intensity or timing of in-region competition for resources are possible, but changes in employment from the proposed Donlin Gold Project are likely to contribute to increased competition for key resources.

Additional competition for subsistence resources from non-local residents would be expected to be of low intensity during the construction, operations, and closure periods of the project, taking into account Donlin Gold work force policies and very low levels of estimated in-migration to local communities associated with mine employment. Renewed in-region competition for moose and Chinook salmon are unpredictable in timing and intensity. Duration would be the same as for effects due to changes in subsistence resources. Extent would be

regional due to the in-region competition, and context would be rated important due to impacts to Chinook salmon and moose, which have been the subjects of urgent conservation measures in recent years.

Effects from Changes in Socio-cultural Aspects of Subsistence (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

Since subsistence activities depend on income to pay for equipment and operating costs, increased income is often associated with increased subsistence production. This finding is supported by data from the 32 interviews conducted in seven Central Kuskokwim communities and Bethel. Respondents were asked whether employment at the mine would have an effect on subsistence harvests in their community.

An overwhelming majority thought employment would have a positive effect because it would mean that people would have the money to purchase gasoline, ammunition, and equipment. As Mr. Bob Aloysius of Upper Kalskag stated:

> *"...employment makes it more possible for people to do a better job of subsistence hunting, fishing, trapping, and gathering because it gives them the opportunity to get some gasoline for outboards, snowmachines, four wheelers (*Bob Aloysius in AECOM 2015a)."

Mr. Aloysius also thought employment at the mine would enhance subsistence opportunities.

> *Like I said in the beginning, a cash economy makes it easier to hunt, fish, trap, gather, and share. Two weeks up there, two weeks home. If it is the summertime you can fish, if is fall you can hunt, if it is winter you can trap. I would just love it, if I was able to work for two weeks up there and come back home and do all kinds of subsistence activities. I think it is more enhancement for the young people. Right now, basically young people are totally unemployed. There is no opportunity to make any money. Once they get the opportunity to work up there for two weeks, they can come back and be a big support to their family. I know this because I have a lot of nephews here in Lower who are always eager to help but their income level is such that it is always impossible. Two weeks on, working, make money. Two weeks come back home and be able to hunt, fish, trap, and gather, to me is awesome (*Bob Aloysius in AECOM 2015a).

A minority of respondents was less positive and said it would depend on the person: if people were already involved in subsistence they would use the money for equipment. This was especially true of older people, but as they pointed out, not everyone is involved in subsistence. Ms. Mary Willis from Stony River reflected on the existing differences in participation of subsistence harvests:

> Respondent: *Kind of, I think maybe 30 percent. I know it wouldn't be over 50 percent because a lot of the younger people don't do much subsistence; just mostly the older people and just very few of the younger people.*
>
> Interviewer: Do you think people would use new income to buy more subsistence gear?
>
> Respondent: *Once again, that's the older people that aren't able to work are the ones who would buy the subsistence stuff, but they wouldn't be employed. The younger people are more likely to buy snowmachines.*

> Interviewer: More recreational?
>
> Respondent: *More recreational than subsistence, I think (*Mary Willis in AECOM 2015a).

Based on these interviews, the effects of higher wages on subsistence production would be primarily positive and of medium intensity in the smaller Central Kuskokwim villages. They would be long-term, lasting the life of the mine. The effects would be regional in extent, since project employees would come from villages throughout the EIS Analysis Area. These effects would impact resources and patterns that are common in context, since family economic strategies mixing employment and subsistence activities are common throughout the EIS Analysis Area. Effects from income interact with those from out-migration, a rotational work schedule, and year-round work.

The effects of occupationally defined work enclaves with transportation that allow workers to live anywhere may encourage the formation of new households within the local communities, or encourage regional out-migration so that communities lose their most productive subsistence producers. Young single men and male heads of mature households are categories of persons most likely to be employed at the mine site, and their absence from their community could undermine a key part of the collaborative tradition that forms the foundation of the subsistence economy resulting in a loss of traditional skills and knowledge.

Out migration as a result of employment at the proposed Donlin Gold Project was of considerable concern to those interviewed by the EIS study team (AECOM 2015a). Respondents were asked three questions:

- Would working at the mine affect people's choice of whether to stay or leave the community?
- What would be the consequences if people did move?
- What would encourage people to stay in the community?

These questions generated a wide variety of responses. Migration out of rural Alaska is currently a serious problem for some communities, often attributed to lack of jobs and high costs of basic services. In a small community, if families leave, the school closes, population declines, and federal or state funding is reduced.

Some respondents noted that people are already leaving some communities but a good job, opportunities to pursue subsistence activities, and improved village infrastructure would enable people to stay or to return. Most respondents said they could not predict what individuals would do and that it depended on the person and the situation; fewer respondents were willing to predict that people would simply leave. A respondent from Upper Kalskag thought that employment at the mine would be an important reason to stay in a community.

> *Boy, I think it would enable them to stay because there would be an opportunity for employment and to live at home. It would help with their opportunity to live in the village. Even though some of the commodities are high, they would have a better opportunity to buy the fuel oil, groceries mainly, and pay for electricity and flush toilets. Being employed up there [the mine], gives the ability for people to stay home, stay in the village. Because in Anchorage, there is no opportunity to hunt, fish, trap, gather, and share (*Bob Aloysius in AECOM 2015a).

The effects of occupationally defined work enclaves and their influence on out-migration from local communities would be of low to medium intensity. Three factors are involved: first, the Donlin Gold Project would result in new employment since the priority in hiring would be for shareholders from the land-owning ANCSA corporations, Calista and The Kuskokwim Corporation. Locally available employment is seen by local residents as reducing the likelihood of out-migration. Keeping young, working-age families in the community would have a positive effect on subsistence production. Secondly, by increasing the local wage economy communities would have the means to improve infrastructure, which would also act to reduce out-migration. The third factor in stemming out-migration is whether regional and village corporations, tribes, and cities invest in community infrastructure by, for example, opening up land to build new homes, lowering energy costs, and providing amenities such as high speed internet or recreational facilities.

In addition to the comments from the interviews, there is the experience of the Red Dog Mine which started operations in 1989 and in which up to 50 percent of NANA shareholders employed at the mine moved out of the region (Section 3.18.2.2.1, Socioeconomics). During the Donlin Gold Project exploration and baseline studies period, many Calista Corporation shareholders were employed at the project site (134 of 198 employees in 2007) (ARCADIS 2013a), and relatively few moved away from the region as a result. For the operations period, with a larger labor pool in the Calista Corporation region than in the NANA region, a larger share of mining payroll may go to regional residents, and "a larger percentage may choose to stay in the region" (ARCADIS 2013a).

Rotational work schedules and year-round rather than seasonal employment could also affect subsistence production and the social dynamics of households and communities. Subsistence is labor intensive with the harvest and processing of food organized by gender: generally, men hunt and fish, and women process; although this is changing with more flexibility in recent years. Young single males and mature males are often the primary harvesters in a community and they are also the most likely to be employed at the mine. As Ms. Lisa Feyereisen of Chuathbaluk described this concern:

> *So it definitely has impacts within the family situation, the dynamics of the family. And the family is our subsistence [producing unit] in my family. You know, we gather food together. We travel together. There is a book called Always Getting Ready. And that's kind of how I feel our life is out here. We are getting ready to go to work. We are getting ready to go home. We are getting ready to go to bingo. We are getting ready to go on the boat again. We are getting ready to go hunting. We are always packing things back and forth, back and forth to the boat, to the snowmachine, taking clothes on, putting clothes off, you know, depending on the weather. And when you are always getting ready by yourself and your significant other isn't there, it does add a complexion* (Lisa Feyereisen URS 2013c).

However, when asked if rotational shift schedules would affect subsistence harvests, a slight majority (56 percent) of those interviewed by the EIS study team in 2014 thought there would be no negative effect, often due to the benefit of increased income. Many noted that rotational work schedules were common in both the mining and oil and gas industries. Ms. Elena Phillips of Crooked Creek explained:

> *No, it wouldn't because they'd be at work. They'd be earning money to pay their bills and whatever. You know, buy stuff that they need and still be able to come back in two weeks*

> *to subsistence and do what they need to do at home, and go back again to work.* (Elena Phillips in AECOM 2015a).

A slight minority (44 percent) of respondents thought that rotational work schedules interfered with subsistence. Ms. Gina McKindy from Aniak related that even with flexible work schedules, the absence of a spouse had an effect on her household's subsistence production.

> *I definitely agree with that, first hand. I am aware. My husband worked there for 9 years. It was before the permitting process. So, the campsite was small enough where they really tried to make accommodations and adjust to the big subsistence times where they needed to be home. Was flexible with schedules but it definitely impacts. It definitely changes, if it is a main provider of the family, if they aren't home to do the hunting. That is a tremendous impact. My husband finally caught a moose, not last year but the two prior years. Before that it was eight years that he didn't get one. Not so much only because of the mine, but it played a part (*Gina McKindy in AECOM 2015a).

The effects of rotational work schedules on subsistence harvests would be of low intensity, assuming that many families would adapt positively and some would find this an adverse effect. Legal hunting seasons are short and if employment schedules interfere with these seasons, then the effect on subsistence harvests could be higher and considered medium in intensity. A primary hunter's absence from the community at critical times of the year could have a long-term or permanent impact on the subsistence production of households and local communities. These effects could be reduced with strategic periods of leave of an appropriate length of time.

Taking the themes together, likely changes to socio-cultural aspects of subsistence during construction and operations include:

- Additional jobs and incomes are likely to increase subsistence activity, since more households would afford equipment and operating costs. Given estimated local and shareholder hiring during the construction period, 25 to 29 percent of households could be affected;[8] while during operations, mine employment could affect 8 to 9 percent of households. Employment is not likely to be evenly distributed across all households in communities within the EIS Analysis Area, so the percent of households affected could vary widely, particularly for the smaller communities near the proposed mine, which are likely to have higher rates of employment. If employment were distributed evenly across the EIS Analysis Area, this would be a positive impact of low intensity, but for smaller communities, it could be a positive effect of medium intensity.
- Out-migration by young families is a risk as a result of jobs and ability to commute to the worksite. Local residents have mixed views on the likelihood of outmigration occurring. However, based on experience with the Donlin Gold Project during the exploration period, and with the Red Dog Mine, it is estimated that 30 percent of local shareholder employees would relocate to urban areas. Distributed across the number of households in the EIS Analysis Area, this would represent about 3 percent of

[8] This estimate is based upon an estimate of 1600 to 1900 construction jobs distributed among members of an estimated 6500 households in the EIS Analysis Area. For the operations period, an estimated 500 to 600 jobs would be distributed among members of an estimated 6500 households in the EIS Analysis Area.

households. Employment and migration patterns are not likely to be uniformly distributed across all households in EIS Analysis Area communities, so the percent of households affected by outmigration could vary widely, particularly for the smaller communities near the proposed mine, which are likely to have higher rates of employment. Evenly distributed across the EIS Analysis Area, this effect would be of low intensity, but it could be of medium intensity in the smaller communities.

For rotational and year-round work and effects, a majority of local residents had positive views; three out of four respondents in every community thought that rotational work schedules would not have a negative effect. Respondents noted that some people already have experience working shifts that took them away from home. They also pointed out that it was necessary to have money in order to pursue subsistence activities and that 2 weeks out of the month was enough time, especially if the time off coincided with hunting seasons in the fall and the salmon runs in the summer, and there were family members at home who could help out while the worker was gone. Other respondents have already observed problems with shift schedules disrupting the cooperative practices of subsistence harvests and processing. The potential adverse effects would be estimated to affect half of the households with mine employees, or up to 5 percent of households. This effect would be of medium intensity.

At closure, the 30 years of employment and income associated with construction and operations would cease. Based on the analyses above, the loss of income would make it harder for subsistence users to support the equipment and operating costs of a robust subsistence lifestyle. Adverse impacts to subsistence practices from workplace enclaves, and rotational and year-round work would cease.

Throughout the life of the mine, economic multiplier effects supporting other businesses in the EIS Analysis Area are likely. This is often referred to as creating sustainable development from the exploration of a non-renewable mineral resource. It is speculative to estimate what levels of associated private sector ancillary development would occur over the 30 years of Donlin Gold Project construction and operation, and to what extent this sector would provide employment for the displaced mine workforce. Donlin Gold plans to work with communities on a Closure Social Impact Assessment during the 3 years prior to closure, to identify alternatives to make use of the skills and infrastructure from the mine project (ARCADIS 2013a). Similarly, it is speculative to estimate public sector spending on education, health care, and public works at that time. There would be a period of adjustment, but many households would have reached a higher standard of living for nearly a generation by the time of closure.

The socio-cultural impacts to subsistence during construction and operations would include positive effects from new income of low intensity region-wide to moderate intensity in the smaller Central Kuskokwim and Upper Kuskokwim communities, with greater employment during the construction period. Adverse effects leading to outmigration are estimated at low intensity for the region and moderate intensity for the smaller Central Kuskokwim and Upper Kuskokwim communities. Based on the Red Dog Mine experience, the differences in the context of the proposed Donlin Gold Project, and the results of interviews on socio-cultural impacts of employment at the proposed Donlin Gold Project, discussed above, effects of shift work and year-round work are estimated to be positive for about half of mine worker families and adverse for half. The interviews found that slightly less than a majority said that mine employment would affect choices about where to live, and many of these comments indicated that employment would help people to stay in the villages. Nearly one-third of respondents

said that the outcome would "depend on the person," recognizing that individuals would be choosing where to reside based on many factors which are hard to predict (AECOM 2015a). The intensity is estimated to be low to medium.

The socio-cultural impacts to subsistence during closure would include the loss of income to invest in subsistence practices, offset by other economic growth activities and planning for economic diversification at closure. At the same time, adverse impacts from out-migration, shiftwork, and year-round employment would cease. The loss of income would be of medium intensity, while all impacts would be long-term in duration, regional in extent, and affect subsistence patterns that are unique in context.

Summary – Alternative 2 Mine Site

For the mine site, the following discussion takes into account impacts to subsistence due to changes in resources, changes in access, changes in competition, and changes in sociocultural practices.

The intensity of impacts would be from none to low intensity for most communities in the EIS Analysis Area. Since the subsistence practices of Cooked Creek residents have historically relied in small part upon resources from the mine site, the intensity of impact would be low, and small adjustments in the seasonal round would sustain harvest levels. For Bering Sea Coast villages relying on migratory waterfowl that pass through the mine site, low intensity impact would result from perceived contamination of waterfowl at the mine site. Socio-cultural impacts associated with potential mine employment would be low intensity beneficial for most villages in the EIS Analysis Area, and medium beneficial in the Central Kuskokwim subregion due to a concentration of employment in communities nearer the mine site. Low to medium intensity impacts would result from changes in outmigration and rotational work shifts. During closure and reclamation, the intensity of effects would be low, but less than during operations.

The duration of effects would be long-term, associated with the construction and operations periods. The perceived risk of contamination of migrating waterfowl would, however, be permanent, in association with the pit lake after mine closure.

The geographic extent of impacts is local to regional. Impacts due to changes in resources and access are associated with the near vicinity of the mine site, except that perceived impacts to waterfowl would be regional in extent. Impacts to subsistence associated with changes in competition and socio-cultural practices would be regional in extent, since the priority on hiring shareholders extends throughout the Yukon Kuskokwim Delta.

The context for these changes would range from common to unique, with an overall rating of important. Impacts might affect some resources that are important in context, like migratory waterfowl, moose, and Chinook salmon. Socio-cultural impacts would affect subsistence based communities that are unique in context.

3.21.6.3.2 TRANSPORTATION FACILITIES

Effects from Changes in Subsistence Resources (Construction, and Operations and Maintenance)

Under Alternative 2, construction and operation of the Bethel Cargo Terminal, Angyaruaq (Jungjuk) Port site, mine access road, and airstrip would result in on-going direct impacts to

subsistence harvests based on changes in subsistence resources from of three impact types: habitat loss associated with the physical footprint of the mine road, airstrip, and ports; displacement of terrestrial and marine animals due to disturbance from human activity; and fugitive dust deposits on plants used for subsistence.

Loss of habitat to the mine access road would affect the residents of Crooked Creek and other Central Kuskokwim communities who use the area of the proposed mine access road and port site primarily for harvesting berries and other plants (see Figure 3.21-54 above). The Angyaruaq (Jungjuk) Port facilities have a footprint of 0.05 square miles (34.57 acres) within the mapped Crooked Creek subsistence use area. Allowing for a zone of noise and dust disturbance adjacent to this footprint, perhaps extending to 0.5 square miles, this is small in relation to the total Crooked Creek subsistence use area of 1,246 square miles.

A portion of the port site is used for subsistence hunting of terrestrial animals by Crooked Creek and other Central Kuskokwim River community residents (Figure 3.21-51 and Figure 3.21-16 above). Construction and operation of the Angyaruaq (Jungjuk) Port would impact a small amount of terrestrial mammal habitat and cause local disturbance of mammals. The loss of habitat to the access road, airstrip and port site would be small compared to the total amount of similar habitat available in the area. Behavioral disturbance would likely be greater during the construction phase than during the operational phase but the number of animals affected would probably be small during either phase given the limited area affected (Section 3.12.3, Wildlife).

In regard to disturbance of terrestrial mammals (particularly moose) by barge noise, there is no formal scientific research for the Kuskokwim River, and local residents have expressed differing opinions. For some, the effects would be minor because animals would likely adapt to the presence of barges, while others think barging would substantially alter animal behavior and that moose would withdraw from the river banks due to audio and visual disturbance from the barges (URS 2014e; see Section 3.12.3, Wildlife). As described in Section 3.10.3, Vegetation, fugitive dust emissions are a by-product of the construction and operation of the mine access road. Dust created by road traffic during construction and operations has the potential to collect on vegetation in the vicinity of the dust sources, and windblown dust could affect vegetation in the vicinity of the source. These effects diminish with distance and with effective dust control measures on the road.

Subsistence harvests in upland habitats would be displaced at low intensity since resources may not be found in accustomed places, but other areas are readily available and harvest effort could be redirected to near-by portions of the use areas with little additional cost or effort.

Barge operations under Alternative 2 would represent a large increase over the estimated baseline of 68 barge trips above Bethel per year. During construction, an additional 65 barge tows (round trips) would carry equipment, building materials, and fuel each year. During the operations period, the proposed mine would require 58 fuel barge round trips and 64 equipment and supplies round trips, for a total of 122 per year, which would represent new barging equal to 180 percent of baseline. Added to the baseline of existing barging activity, the new total would be 290 barge round trips, or 280 percent of the baseline level.

As described in Section 3.13.3, Fish and Aquatic Resources, potential impacts include:

- Effects on feeding efficiency and localized alteration of fish food resources such as invertebrate communities due to vessel wave energy resulting in increased erosion, suspended sediments and turbidity;
- Fish displacement, stranding, and behavioral disturbance; and
- Fish injury and mortality due to propeller shear forces and strikes.

The analysis focuses particularly on portions of the Kuskokwim River with confined channels and shallow shoreline gradients, where these forces and impacts would be larger. An analysis of the river channel identified narrow reaches including Nelson Island, Birch Tree Crossing, the vicinity of Aniak, the mouth of the Holokuk River, and north of the mouth of the Oskawalik River (AMEC 2014). Other narrow and shallow reaches of the river may also see similar impacts.

The detailed analysis of impacts to fish resources in the Kuskokwim River in Section 3.13, Fish and Aquatic Resources, concluded that likely effects to subsistence fish resources from potential fish displacements and stranding would be low to medium intensity, with greater impacts associated with the speed of downriver barges traveling up to 10 knots – compared to the barges headed upriver at 3.5 to 4 knots – and greater effects on rainbow smelt spawning areas. Potential localized impacts from bed scour on rainbow smelt and other fish and aquatic life would occur at a low to medium level of intensity, depending on how and where tugs are operated, water depth, channel geometry, character of riverbed substrates, and life stages of fish and aquatic species in the vicinity of propeller-generated hydraulic forces. A medium level of intensity is defined as affecting reproduction and survival of individuals, noticeable changes to the character and quantity of aquatic habitat, and detectable levels of injuries or mortalities, but with resource populations in the EIS Analysis Area remaining within the range of normal variation. The impacts are generally localized in extent, focused on the reaches of the river with confined channels and shallow shoreline gradients, and of long duration, lasting through the life of the project. These impacts would affect subsistence fish resources that are common in context, except for Chinook salmon, for which the context is important due to the strong conservation measures implemented in 2014, and expected to last for some years to come.

In routine operations, subsistence harvests of fish resources would be minimally affected by construction and routine operations of the other components of transportation facilities such as the Bethel and Angyaruaq (Jungjuk) port sites, mine access road, and airstrip. The potential effects of a large-scale fuel spill are addressed separately in Section 3.24, Spill Risk.

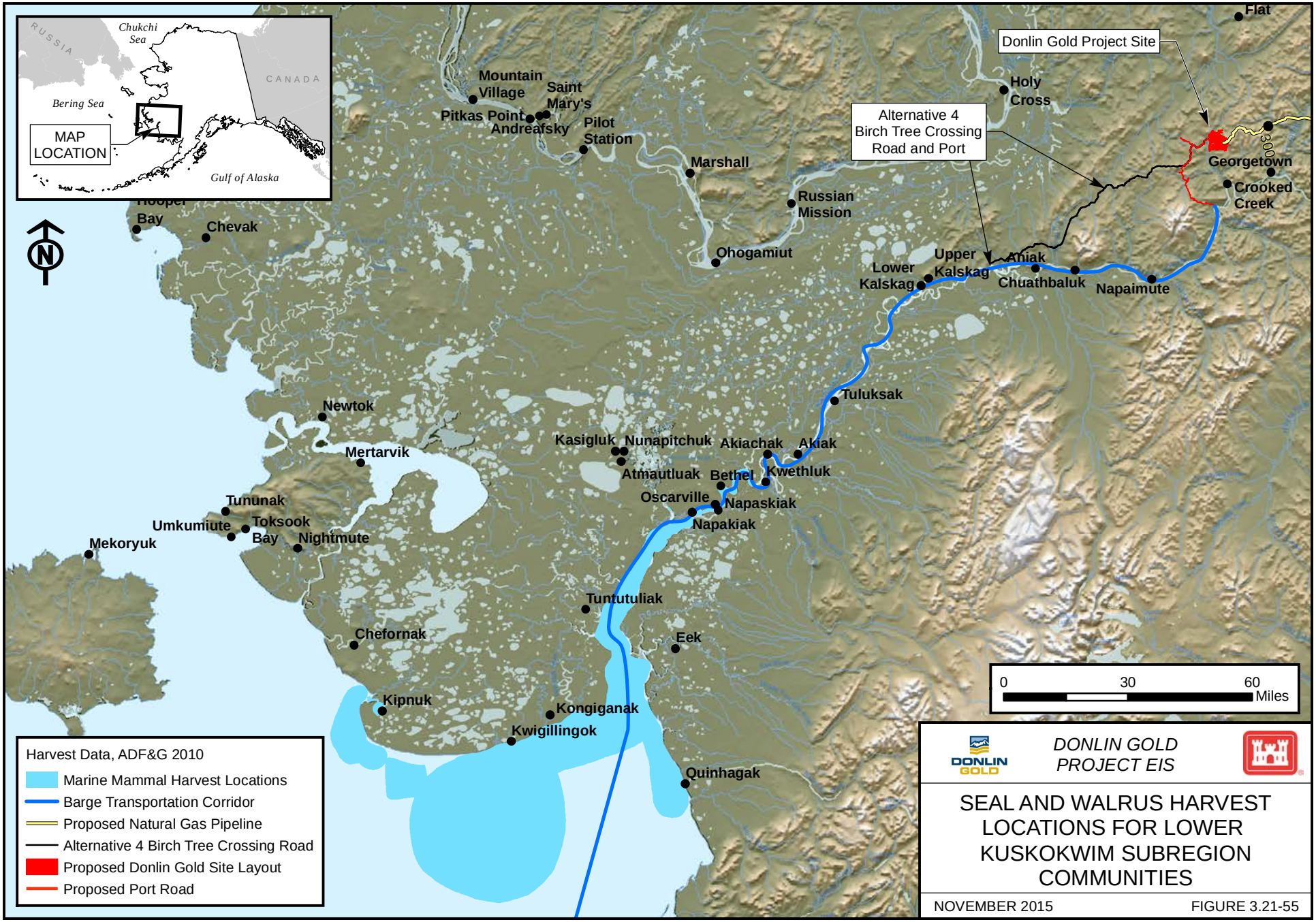
The potential effects on marine mammal subsistence would largely be limited to behavioral disturbance and short-term displacement of seals in the lower Kuskokwim River (Figure 3.21-55). Marine mammals are not common in the Kuskokwim River above Kuskokwim Bay, so noise disturbance during construction of improvements to the Bethel Cargo Terminal would not likely disturb many marine mammals. Ocean-going fuel barge traffic from Dutch Harbor (14 trips per year) and cargo traffic (12 trips per year) to Bethel would traverse marine mammal habitat in Kuskokwim Bay, but disturbance would be limited to brief periods with close proximity to the vessels (Section 3.12.4.2.2, Wildlife, Marine Mammals).

The overall effects of the construction and operations of transportation facilities on habitat would be considered low in intensity due to the small acreage involved and ready available alternative use areas nearby. The effects would be of long-term duration, and local in extent, being confined to the road and port site. The effect of fugitive dust on subsistence harvest of

plant resources would be of low intensity, in light of dust control measures on the road, and ready availability of alterative use areas nearby. Effects would be of long-term duration lasting the life of the project, and would be local in geographic extent, decreasing in effect with distance from the mine access road. Increased barge traffic would increase intermittent disturbance to subsistence fishers of low to medium intensity due to the average of 8 hours or more between barge passages. Greater disturbance would occur in narrow and shallow reaches of the river. Alternative fishing strategies would generally allow users to meet harvest goals at low to medium additional effort and cost. The barge impacts on terrestrial animals would be considered of low intensity because of recurring but small magnitude disturbance to resources from passing barges during the open water season (Section 3.12.3, Wildlife), with the effect that subsistence hunters may not see animals for some time following a barge passage, and may be displaced to alternative portions of their use area. Since the transportation schedule during the operations phase would apply to the entire lifespan of the mine, the effects would be long-term. The geographic extent would be limited to the river corridor, which is a long linear feature considered regional in extent. Effects on marine mammals would be of low intensity due to the low frequency of project-related ocean-going barge transit of Kuskokwim Bay, long-term duration, and local in extent, limited to the lower portion of the transit corridor. For all resources, plants, fish, terrestrial and marine mammals, the context would be common, except for Chinook salmon and moose for which the context would be important due to the exceptional conservation measures implemented in recent years.

Effects from Changes in Subsistence Resources (Closure, Reclamation, and Monitoring)

During the closure phase of Alternative 2, effects from changes in subsistence resources would be at much lower levels as project support activity at the Angyaruaq (Jungjuk) Port site, mine access road, and airstrip would decrease. At the Angyaruaq (Jungjuk) Port site, the sheet piling dock and staging yard would be dismantled, with only a minimal barge landing remaining in place. The mine access road and airstrip would remain in place during the post-closure period to support reclamation and monitoring activities at the mine site. Some supplies and fuel would be barged up to the Angyaruaq (Jungjuk) Port periodically but the numbers of barges needed would be a fraction of the operations phase, more similar to baseline conditions. The road and airstrip would see periodic use associated with monitoring activities, which would reduce the impact to local subsistence resources (Section 3.12.3.2.2, Wildlife). Barge traffic to the EIS Analysis Area would be infrequent following closure which would reduce the levels of impact to subsistence fishing resources and subsistence fishers within the Kuskokwim River to near baseline levels. The effects on subsistence use from changes in resource abundance and availability following closure would be low in intensity (but less than during operations) and permanent in duration, affecting a local area in extent, and resources common in context, except for Chinook salmon and moose, which are important.


RUSSIA
Chukchi Sea
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
Donlin Gold Project Site
Alternative 4 Birch Tree Crossing Road and Port
Flat
Holy Cross
Mountain Village
Saint Mary's
Pitkas Point
Andreafsky
Pilot Station
Marshall
Russian Mission
Ohogamiut
Hooper Bay
Chevak
Lower Kalskag
Upper Kalskag
Aniak
Chuathbaluk
Napaimute
Georgetown
Crooked Creek
300
Tuluksak
Newtok
Mertarvik
Kasigluk
Nunapitchuk
Akiachak
Akiak
Atmautluak
Bethel
Kwethluk
Oscarville
Napaskiak
Napakiak
Tununak
Umkumiute
Toksook Bay
Nightmute
Mekoryuk
Tuntutuliak
Eek
Chefornak
Kipnuk
Kongiganak
Kwigillingok
Quinhagak
0
30
60
Miles
Harvest Data, ADF&G 2010
Marine Mammal Harvest Locations
Barge Transportation Corridor
Proposed Natural Gas Pipeline
Alternative 4 Birch Tree Crossing Road
Proposed Donlin Gold Site Layout
Proposed Port Road
DONLIN GOLD
DONLIN GOLD PROJECT EIS
SEAL AND WALRUS HARVEST LOCATIONS FOR LOWER KUSKOKWIM SUBREGION COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-55

Effects from Changes in Access to Subsistence Resources (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

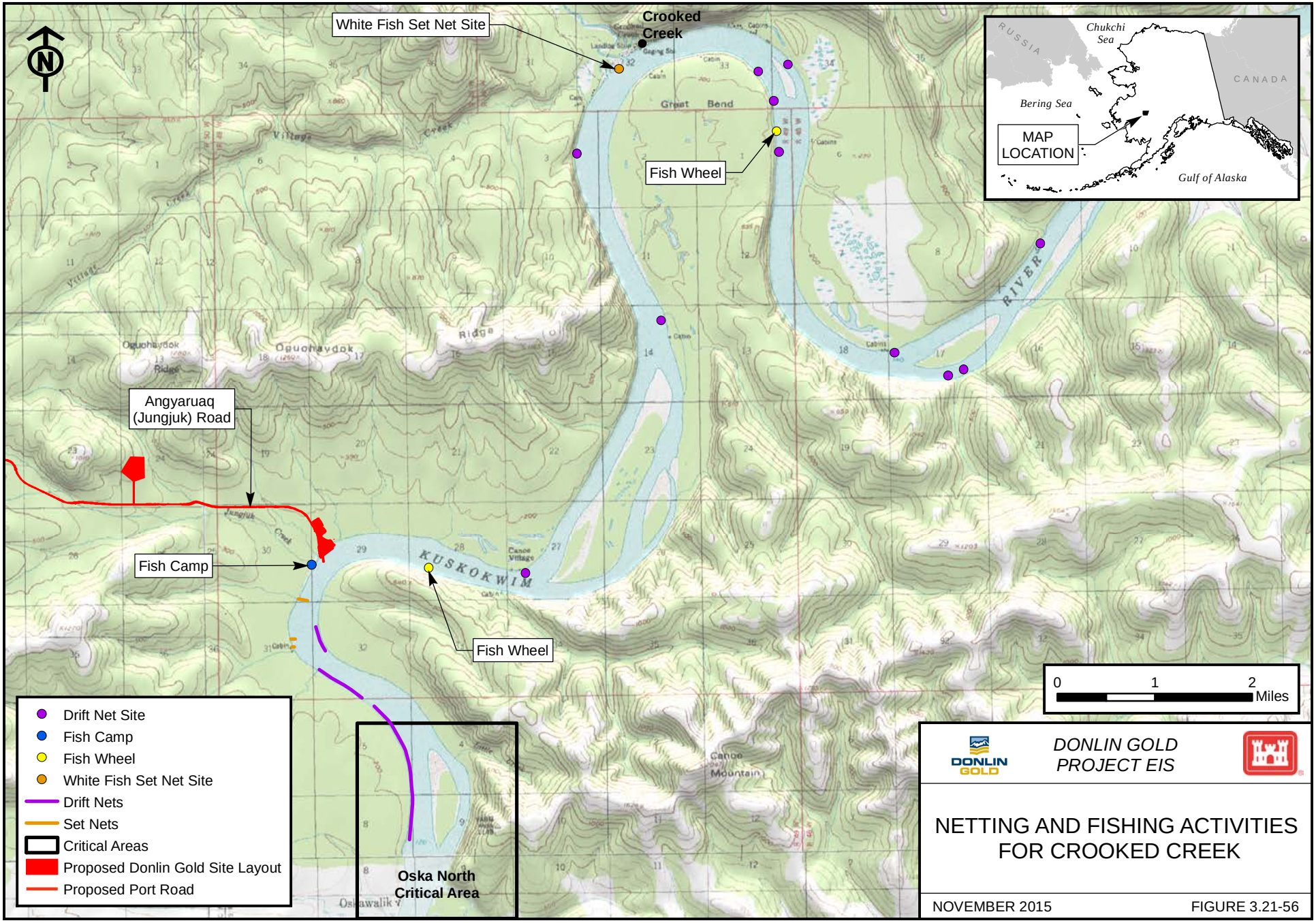
Under Alternative 2, construction and operation of the mine site road and the Angyaruaq (Jungjuk) Port site would displace access and use of a small portion of the harvest area used by Crooked Creek residents to gather plants and berries (Figure 3.21-16 and Figure 3.21-54 above). An estimated 1 mile disturbance buffer around the port site and on either side of the initial segment of the mine access road would represent about 6 square miles of the total mapped Crooked Creek berry and plant use area of 122 square miles, or about 6 percent. Effects would be localized to the area around the road and port site, and of low intensity, because users can access alternative areas at low cost and effort, with little or no change in total harvest success. Other communities do not typically use the area of the proposed road, but they do travel along the Kuskokwim River, including the port site, while hunting for moose along the river banks (Figure 3.21-51 above).

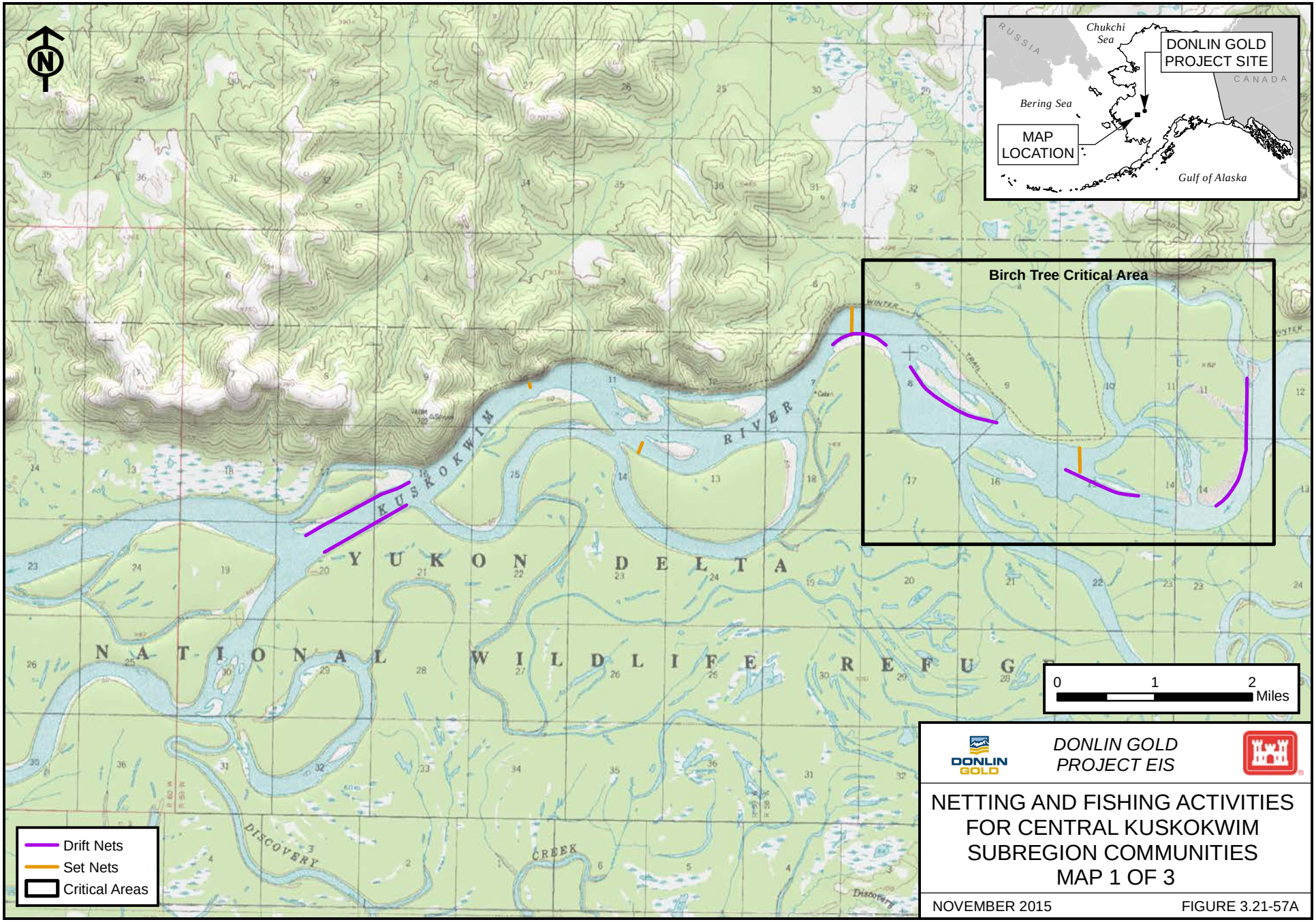
Regarding the Bethel Cargo Terminal, most Bethel residents fish for salmon or freshwater fish along a large segment of the Kuskokwim River below and above Bethel. Construction and operation of the proposed Bethel Cargo Terminal, adjacent to the existing Knik Construction Bethel Yard Dock, would displace use of a small portion of this fishing area. However, the Bethel Native Corporation in comments to the Corps regarding the Knik Construction permit application noted the importance of this area. Additional discussion between the permit applicant and the Corps is underway regarding the potential hydrological effects.

> *The "choke point" is magnified because the east bank of the Kuskokwim River, located opposite the proposed dock, is shallow and will become increasingly more shallow due to the natural flow of the river and be accelerated by Knik's proposed dock expansion into the River. This site on the east bank is a traditional subsistence fishing site for BNC shareholders. The erosion caused by Knik's project would negatively impact BNC lands in the vicinity, including BNC lands and Indian trust lands on the east back through severe scouring or shoaling…* (Bethel Native Corporation 2014).

Construction and operation of the Angyaruaq (Jungjuk) Port site would displace access to one known fish camp located just below the mouth of Angyaruaq (Jungjuk) Creek currently used by residents of Crooked Creek (Figure 3.21-56). Fishing sites located above the mouth of Angyaruaq (Jungjuk) Creek, and in the Great Bend of the Kuskokwim River, are unlikely to be affected by operation of the port site (see Figure 3.21-56 and Figure 3.21-17 above). More detailed drift net and set net fishing locations in the vicinity of Birch Tree Crossing, Aniak, and Chuathbaluk are shown in Figures 3.21-57A, B, and C for Central Kuskokwim river communities. A broader scale depiction of Central Kuskokwim subsistence salmon fishing locations is shown in Figure 3.21-58. For some individuals, the effect would be medium in intensity causing them to relocate their camp or fishing locations, but alternative locations are available at moderate cost and effort.

Fishing areas for Lower-Middle Kuskokwim subregion and Lower Kuskokwim subregion communities below Bethel are not expected to see disruption from vessel traffic (Figure 3.21-59) because ocean-going fuel barge traffic from Dutch Harbor (14 round trips per year) and cargo traffic (12 round trips per year) to Bethel would transit the lower river, but with limited frequency compared to the in-river barge traffic from Bethel to Angyaruaq (Jungjuk) Port.


White Fish Set Net Site
Crooked Creek
Great Bend
Fish Wheel
Angyaruaq (Jungjuk) Road
Fish Camp
Fish Wheel
KUSKOKWIM
RIVER
Oguchaydok Ridge
Canoe Mountain
Oska North Critical Area
MAP LOCATION
Chukchi Sea
Bering Sea
Gulf of Alaska
RUSSIA
CANADA
0 1 2 Miles
Drift Net Site
Fish Camp
Fish Wheel
White Fish Set Net Site
Drift Nets
Set Nets
Critical Areas
Proposed Donlin Gold Site Layout
Proposed Port Road
DONLIN GOLD
DONLIN GOLD PROJECT EIS
NETTING AND FISHING ACTIVITIES FOR CROOKED CREEK
NOVEMBER 2015
FIGURE 3.21-56



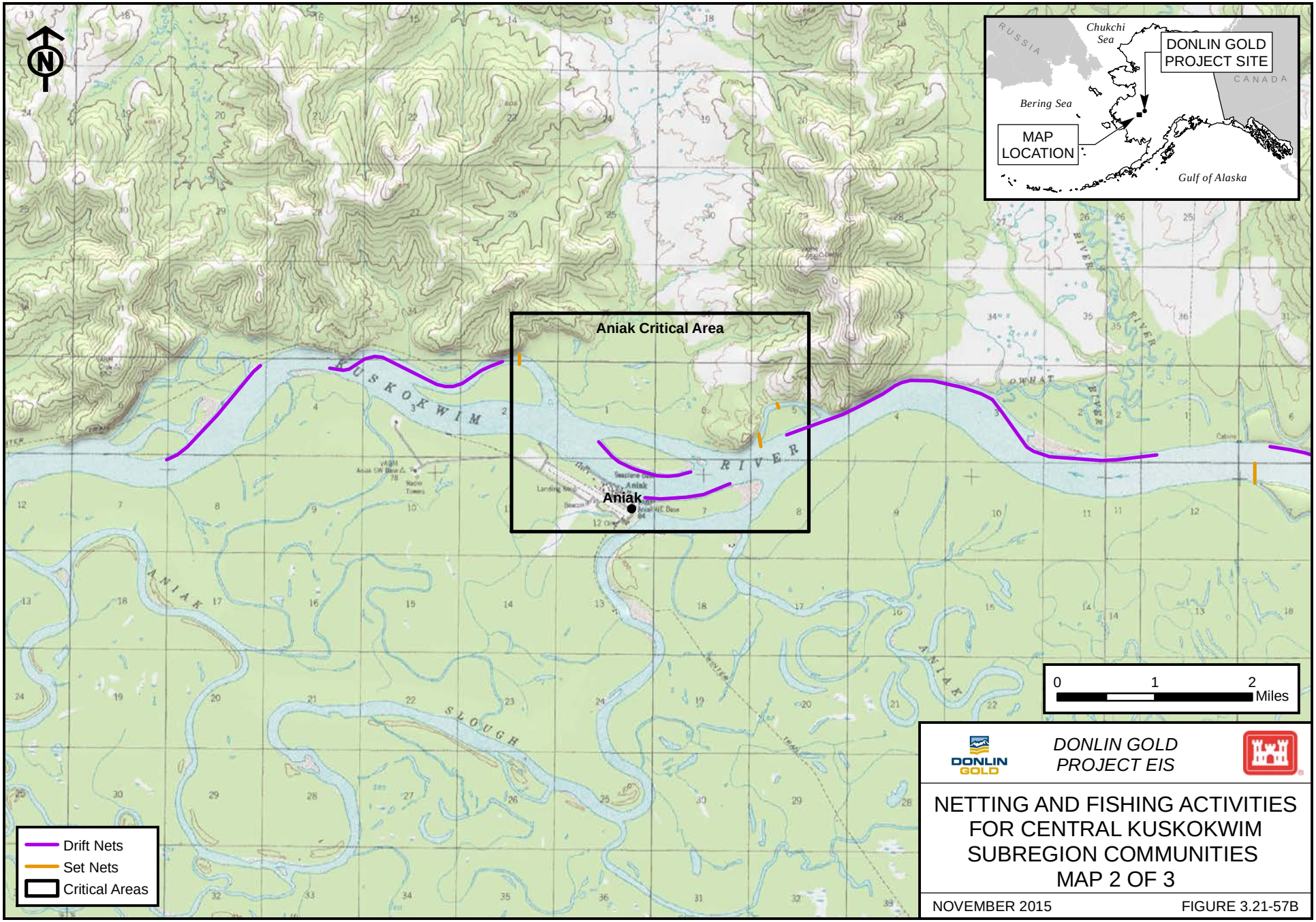
DONLIN GOLD

DONLIN GOLD PROJECT EIS

NETTING AND FISHING ACTIVITIES FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES MAP 1 OF 3

NOVEMBER 2015

FIGURE 3.21-57A



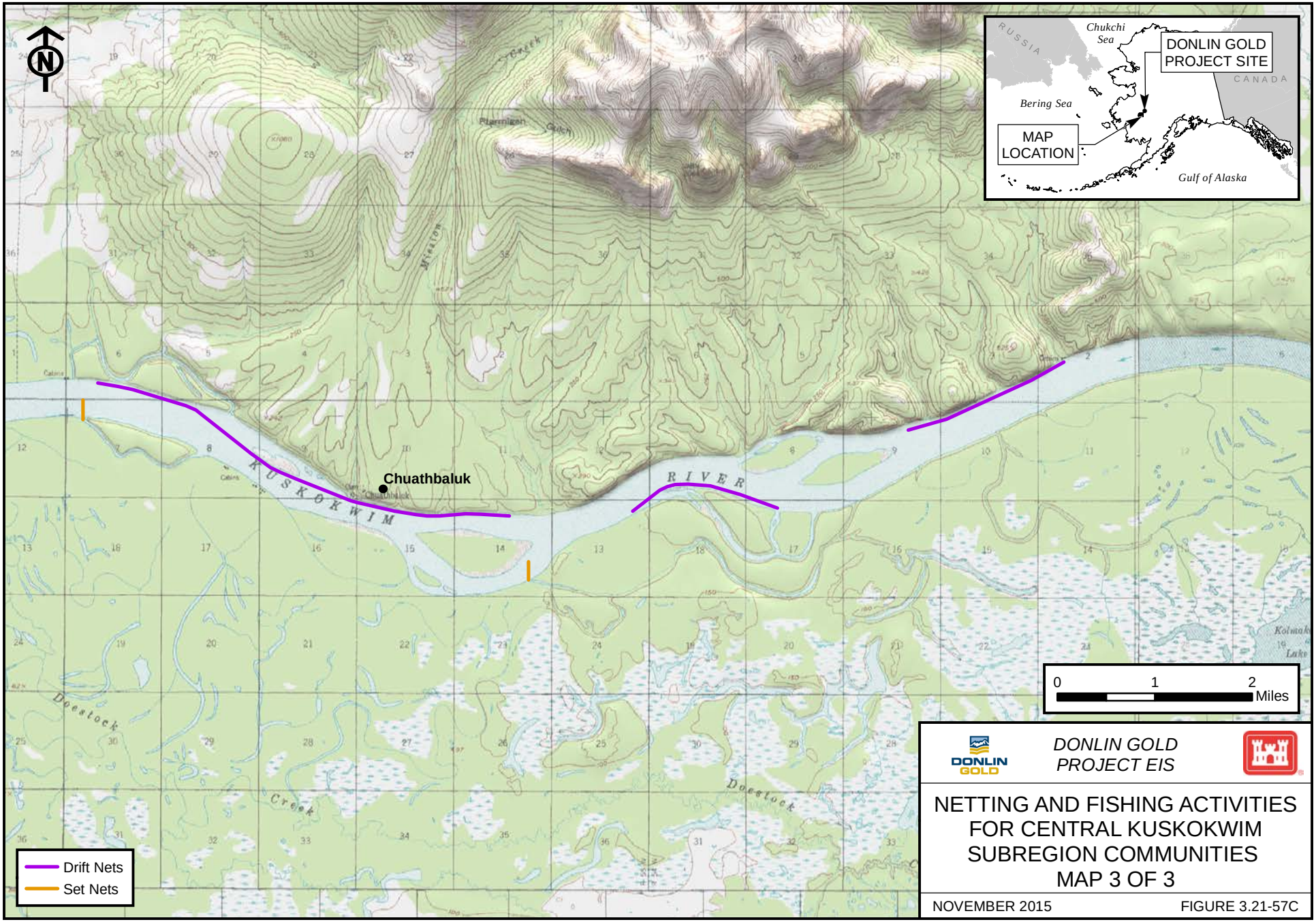
DONLIN GOLD

DONLIN GOLD PROJECT EIS

NETTING AND FISHING ACTIVITIES FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES MAP 2 OF 3

NOVEMBER 2015

FIGURE 3.21-57B

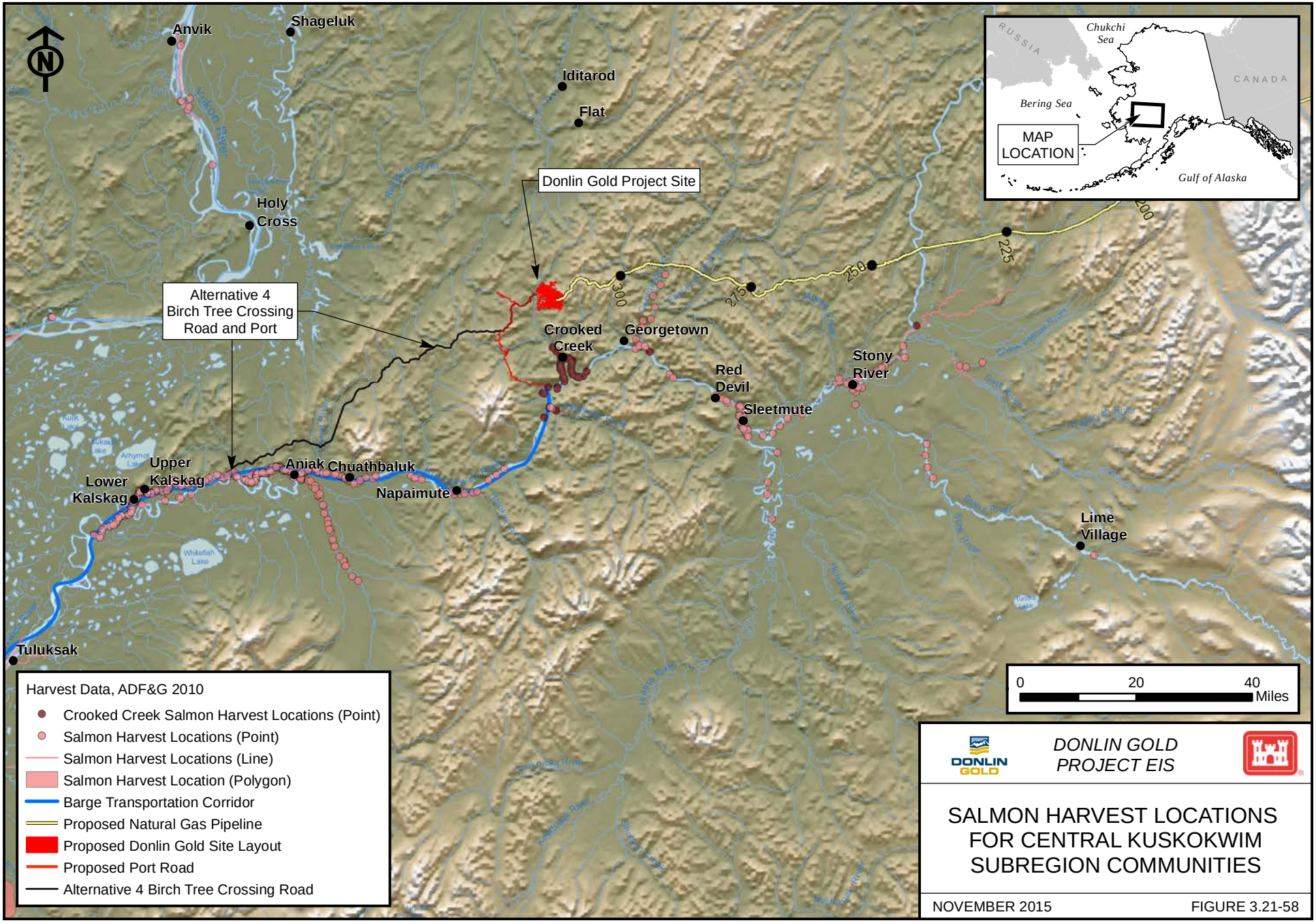


DONLIN GOLD PROJECT EIS

NETTING AND FISHING ACTIVITIES FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES MAP 3 OF 3

NOVEMBER 2015

FIGURE 3.21-57C



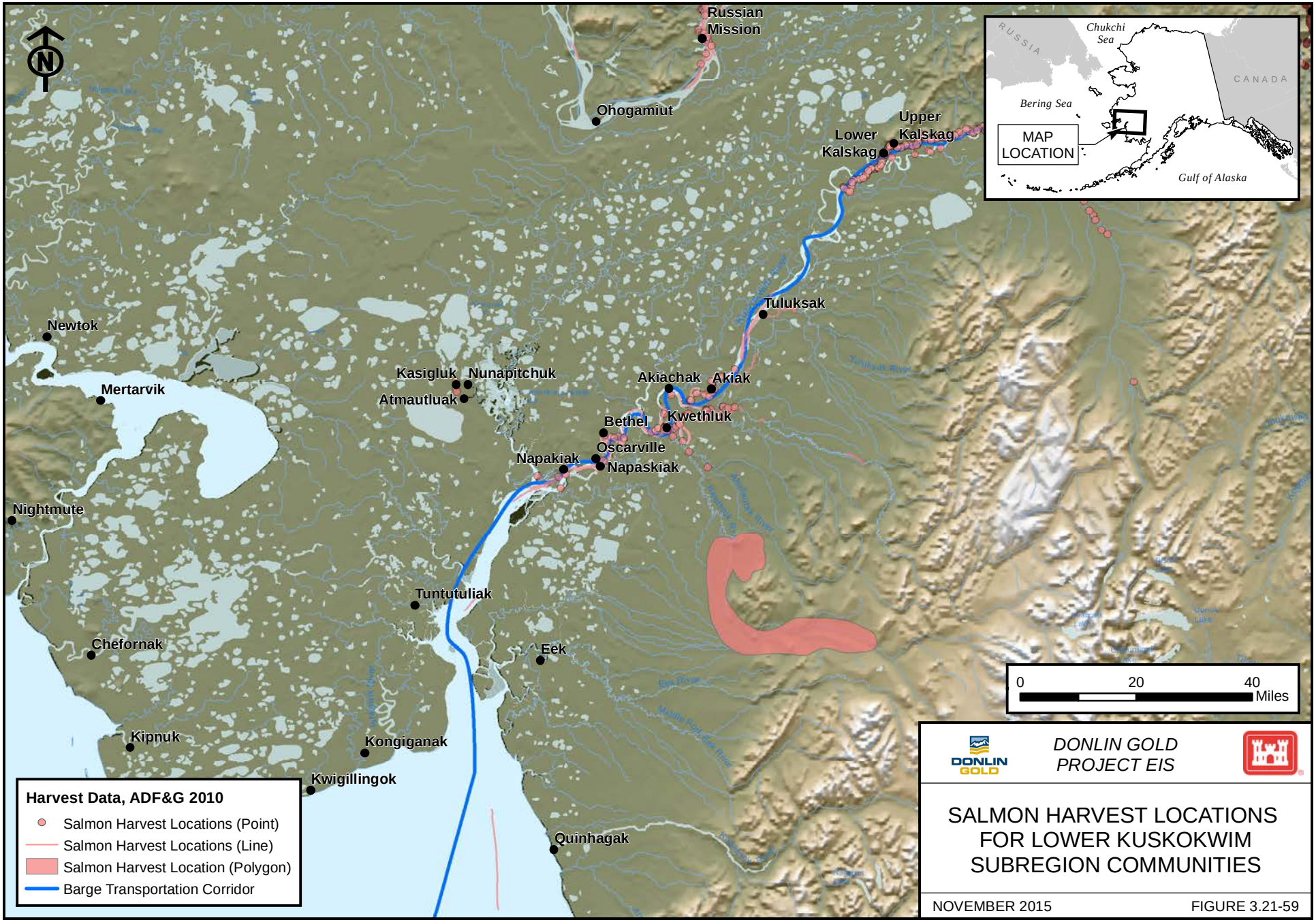
DONLIN GOLD

DONLIN GOLD PROJECT EIS

SALMON HARVEST LOCATIONS FOR CENTRAL KUSKOKWIM SUBREGION COMMUNITIES

NOVEMBER 2015

FIGURE 3.21-58


Russian Mission
Ohogamiut
Upper Kalskag
Lower Kalskag
Tuluksak
Newtok
Mertarvik
Kasigluk
Nunapitchuk
Atmautluak
Akiachak
Akiak
Kwethluk
Bethel
Oscarville
Napakiak
Napaskiak
Nightmute
Tuntutuliak
Chefornak
Eek
Kipnuk
Kongiganak
Kwigillingok
Quinhagak
MAP LOCATION
RUSSIA
Chukchi Sea
CANADA
Bering Sea
Gulf of Alaska
0
20
40
Miles
Harvest Data, ADF&G 2010
Salmon Harvest Locations (Point)
Salmon Harvest Locations (Line)
Salmon Harvest Location (Polygon)
Barge Transportation Corridor
DONLIN GOLD
DONLIN GOLD PROJECT EIS
SALMON HARVEST LOCATIONS FOR LOWER KUSKOKWIM SUBREGION COMMUNITIES
NOVEMBER 2015
FIGURE 3.21-59

Local residents have expressed differing opinions about the effect of increased barge traffic on moose in the riparian environment, and therefore on potential displacement of their moose hunting in this zone as they have done historically. As noted above, some hunters who hunt along the river have expressed the opinion that more frequent barge traffic would create disturbances keeping the animals away from the riverbank, thus making hunting more difficult, while others have said that moose become habituated to the barge sound and would not be displaced from the river banks. Locals who use the mainstem of the river as a way to reach more distant locations away from the river, such as the Holokuk and Oskawalik rivers, do not think barge traffic would have an effect on moose behavior or their subsistence harvest of moose (URS 2014e). The effects from changes in access to subsistence resources from increased barge traffic would be limited to the mainstem of the Kuskokwim River, of low intensity, possibly causing some people to shift their hunting strategies to readily available alternative areas. The effects would be long-term lasting for the duration of the project. Effects would also be regional in extent, and affecting terrestrial resources, including moose that are important in context.

Local residents have pointed out that subsistence Chinook salmon fishing has been restricted on the Kuskokwim River and if closed periods continue, conflicts are more likely between barges and fishers. If fishing is unrestricted such that people can conduct subsistence fishing anytime, then the likelihood of conflicts would be reduced (URS 2014e). Barging could potentially affect subsistence fishing by generating propeller wash and wakes that could interfere with fish nets, fish cutting rafts or fish wheels, and processing rafts, or erode river banks so that people either have to abandon or move fish camps.

According to the analysis in Section 3.13.3.2.2, Fish and Aquatic Resources, waves from upriver bound barges would be of negligible height (0.01 to 0.05 feet), while waves from downriver bound barges would be up to 1 foot, depending on the river channel configuration. Analysis also showed that the greatest potential effect from downstream barge traffic would be in the vicinity of Aniak and (Upper) Kalskag (Section 3.13.3.2.2, Fish and Aquatic Resources).

Use of fish camps in western Alaska has been changing in recent decades for a number of complex interacting ecological, economic, and social reasons (Wolfe and Scott 2010). In some communities, residents have stopped going to fish camp because of employment or lack of available land to establish new camps (Ikuta et al. 2013). Analysis to date identified only a few instances in which displacement of fish camps is likely to occur, for example, at the location of the Angyaruaq (Jungjuk) Port site (see Figure 3.21-56).

Intermittent periods of interference with drift nets could occur during barge season, but confined to specific locations along the river for limited periods. There is an estimated 8-hour interval or more between barge passages.

Current information suggests that potential for impacts is greatest when barges pass drift nets. Drift nets are the most prevalent gear type used to harvest salmon in the Kuskokwim River because they fit with current fishing practices that emphasize harvesting multiple salmon species, flexible fishing schedules, and fishing from the village instead of a fish camp (Ikuta et al. 2013). Of the 878 households surveyed in Kuskokwim communities 2012, 79 percent reported harvesting salmon with drift gill nets and 12 percent reported using set nets. In Aniak, where the greatest potential impact could be felt from downriver barge traffic, 60 out of 89 households reported using drift nets while 6 reported using set nets. At both Lower and Upper Kalskag no household reported using a set net (Fall et al. 2014). Residents of Upper Kalskag report that

current levels of barge traffic has already influenced the way they fish as fishers either try to drift before the barge passes or wait until well after the barge has passed (Ikuta et al. 2013).

Several approaches are incorporated into river barge fleet design and operations plans to reduce potential impacts of vessel traffic. These include maximizing cargo capacity to minimize the number of trips and implementing a communication strategy that keeps local communities informed of schedules and current status of barge traffic location. Information on barge locations and speed would be available on the Internet, and net locations would be incorporated into electronic river charts to reduce incidents of damage (AMEC 2013).

The context of the Chinook salmon resource is elevated to important due to the low population status and conservation measures adopted in 2014 to protect the spawning run, including a complete closure of subsistence fishing for Chinook salmon.

For some communities, harvest areas for non-salmon fish species such as trout and various whitefish species are the same as those for salmon, so the effects of barge traffic on the harvest of freshwater fish would be similar. It is important to note that the harvest of freshwater fish takes place throughout the year, and harvest locations for freshwater species are more diverse than those for salmon. For these reasons, the effect of barge traffic on the harvest of freshwater fish would be low in intensity, limited in a regional extent to the main Kuskokwim River, but long-term lasting for the duration of the project, and affecting resources that are common in context.

During the closure and reclamation period, activity at the Angyaruaq (Jungjuk) Port site, mine access road, and airstrip would decrease. At the port site, the sheet piling dock would be removed and the mine access road and airstrip would remain in place during the post-closure period to support reclamation and monitoring activities at the mine site. If local use of the access road is allowed, access to subsistence resources would increase. Because there are currently few roads in the area, it is likely that local residents may want to use the port and road to access subsistence resources, especially those who had worked at the mine or port and have become knowledgeable about the area.

Supplies and fuel would continue to be barged to the port site on a periodic basis but the numbers of barges would be much smaller than during operations. This would reduce the levels of impact to subsistence fishing in the Kuskokwim River and reduce the disturbance to terrestrial resources as well.

Overall effects of changes in access to subsistence resources during closure would be beneficial, of low intensity, and of permanent duration. The impacts would be localized in extent, affecting a small portion of the Crooked Creek subsistence use area, and affect resources that are common in context, except for Chinook salmon which are important in context.

Effects from Changes in Competition for Subsistence Resources (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

The effect of construction, operations, and closure of the transportation facilities on competition for subsistence resources would be similar to those of the mine site, i.e., of low intensity. It is likely that local residents would provide much of the workforce for construction and operation of the transportation facilities. During the operations period, approximately 100 workers would be needed during the 3- to 4-month shipping season. A small portion of the transportation-related workforce may elect to take up residence in Bethel, but this would be a small increment

in relation to the large population of this regional center community. Closure of the mine would reduce the workforce even further and without regular employment it is unlikely that workers who moved to the area during operations would remain in the area. For this reason, closure would likely further reduce the effects of competition. The extent of these effects would most likely be region-wide, of permanent duration, and have an effect on common resources.

Effects from in-region competition for scarce subsistence resources are the same as those identified in relation to the mine site.

Effects from Changes in Socio-cultural Aspects of Subsistence (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

The socio-cultural effects of construction, operations, and closure of the transportation facilities would be similar to those associated with the mine site. However, jobs associated with the transportation facilities and barging would be seasonal rather than year-round. It is expected that employment on barges would involve rotational shifts of two weeks on and two weeks off, during the barging season.

Summary – Alternative 2 Transportation Facilities

The intensity of impacts would be low to moderate, taking into account low levels of impact on plant, terrestrial and marine mammal resources, and low to moderate levels of impact to fish resources. Impacts on access would be of low intensity, affecting small portions of the Crooked Creek subsistence use area along the road and the port site. Barge passage would result in intermittent, low-level disturbance along the barging corridor, which may include displacement of drift net subsistence fishers, or impaired access for shore-based subsistence activities (set nets and processing rafts).[9] External competition would be of low intensity, while in-region competition would be the same as for the mine site. Impacts to socio-cultural aspects of subsistence would be the same as the mine site, though employment in barging would be seasonal. The geographic extent would be regional extending throughout the communities in the Central and Lower-middle Kuskokwim subregions. The duration of these effects would be long-term, and seasonally limited to the open-water transportation period, lasting for the construction period and the operational life of the Project. These activities would affect resources that are common in context and relatively abundant throughout the EIS Analysis Area, except for Chinook salmon for which the context is important. The context of subsistence practices would be unique.

For residents of Crooked Creek, effects would be of medium intensity due to lost access to fishing sites and vegetation harvest areas located in the vicinity of the port and access road. These impacts would be long-term, localized, and affecting common resources.

With closure, effects would be further reduced but not eliminated since the mine access road would remain operational and the types of effects associated with the road would continue, but

[9] Although the increase in barging activity and intervals between barge tow passages can be quantified, it is not possible to quantify a likely percent of decline in subsistence fishing harvest levels as a result. Subsistence harvest practices are strategic and adaptive. Subsistence users have harvest targets and may redirect effort to adjacent areas, extend time spent in harvesting, or increase harvest of other species to compensate for impaired access in some areas. As a result, it is not possible to extrapolate a linear relation between increased disturbance and reduced overall harvest success.

at much lower levels. These potential effects would be of low intensity, as barging on the Kuskokwim River would be substantially reduced after closure, which would reduce behavioral disturbance of animals. The effects would be permanent and localized to the Kuskokwim River corridor. In summary, overall impacts from closure would be minor in intensity, of permanent duration, and regional in extent. The context for all resources would be common, with the exception of the important subsistence resource of Chinook salmon and the unique subsistence practices.

3.21.6.3.3 NATURAL GAS PIPELINE

Construction of the 315-mile, buried natural gas pipeline would take place concurrently in two spreads over a 2½–year period. Spread 1 is from the mine site at MP 315 to the Tatina River at MP 127, and Spread 2 runs from the Tatina River at MP 127 to the pipeline start near Beluga at MP 0. Construction would be confined to a 150-foot temporary construction ROW, along with ancillary facilities including material sites, pipe storage yards, temporary roads, temporary airstrips, and worker camps. The pipeline would be constructed in segments so the entire length of the pipeline corridor would not be impacted by construction activities at the same time. After construction, the ROW would be revegetated and temporary construction facilities such as culverts and bridges would be removed. Temporary access roads, shoofly roads, temporary airstrips, temporary barge landings, and material sites would be recontoured, stabilized, rehabilitated, and reclaimed. Where the vegetation mat would be stripped and stockpiled during construction, it would be spread to facilitate natural revegetation (see Chapter 2, Section 2.3.2.3.6). No road or transportation enhancements along the pipeline corridor would remain in place. After construction, during the operations period, a 50-foot ROW (or 51.5 feet on BLM lands) would be brushed every decade to support visual inspection and monitoring. The operations ROW would not be fenced.

Effects from Changes in Subsistence Resources (Construction)

The effects of pipeline construction on subsistence practices due to changes in resource availability and abundance would result from habitat loss and disturbance of some wildlife during construction. Habitat loss would be confined to the pipeline construction ROW, and scattered sites supporting construction such as borrow pits, staging areas, camps, and shoo-fly roads, amounting to 11,500 acres and 2,600 acres respectively (Section 3.2, Soils). The activities that might disturb during the construction period would generally be limited to a single construction season in any segment of the pipeline see Sections 2.3.2.3.4 and 2.3.2.3.5 in Chapter 2, Alternatives), although staging materials at temporary sites may extend activity beyond one season. This could temporarily displace wildlife, obstruct movement, or otherwise affect animal behavior. It is unlikely that construction would result in direct mortality (Section 3.12.3.2.2, Wildlife). The potential for disruption of the seasonal movement of moose, caribou, Dall sheep, and bison, and the associated impacts to vital life stages, are of particular concern to local residents as expressed during the Scoping period. However, given the short period of disruption from construction, it is unlikely that this would directly reduce the subsistence resource populations. Overall effects would to subsistence uses would be of low intensity and localized in confined areas of construction, with alternative locations easily available. Effects would be of temporary duration, and limited to the specific period of construction in each spread of the pipeline construction sequence. The resources affected are generally common in context.

Effects on subsistence fishing due to changes in fish resources from the pipeline construction depend on the distribution of anadromous and/or resident species along the 315-mile ROW, and risks of habitat degradation from stormwater runoff, suspended solids, and reduced flows from disturbed soil and water withdrawals for ice-road construction. Several streams, before and after where the proposed pipeline crosses the high elevation rocky terrain of the Alaska Range, are habitat for salmon and non-salmon species. As described in Section 2.3.2.3.5, the pipeline design includes minimum impact methods to cross salmon-bearing streams, and to control sedimentation damaging fish habitat, and these methods are likely to be effective. Section 3.13, Fish and Aquatic Resources, concluded that minor direct and indirect effects to subsistence fish would result from construction of the natural gas pipeline. As a result, impacts to subsistence fishing due to changes in fish populations attributable to the pipeline construction would be of low intensity. These effects would be temporary during construction and local in extent, concentrated in discrete segments in the immediate vicinity of the pipeline ROW or stream crossings. The resources affected are generally common in context, except for Chinook salmon, and the designated Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act in the reaches of some streams crossed by the pipeline.

Effects from Changes in Subsistence Resources (Operations and Maintenance; and Closure, Reclamation, and Monitoring)

Following the construction period, the natural gas pipeline would be buried except for two 1,300-foot long above-ground fault crossings, block valves located every 20 miles, and a pigging station located at the halfway point. The pipeline ROW would not be fenced, so would not block animal passage. A 50-foot corridor (or 51.5-foot on BLM lands) would be brushed every 10 years to provide for visual monitoring. Operations would have a low intensity impact on subsistence resources since there would be little activity or human presence in the vicinity of the ROW. Subsistence resources that would move away or were displaced because of construction would in all likelihood return.

During closure, the pipeline would be sealed and left in place below ground with no large excavations taking place. The associated above-ground pipeline facilities would be dismantled and removed. The ROW would return to its preconstruction state. The effect on subsistence resources would be of low intensity and localized in confined areas during operation and closure. Effects would be long-term in duration (life of the project), and limited in extent to the local area of the pipeline ROW activity affecting resources that are common in context.

Effects from Changes in Access to Subsistence Resources (Construction)

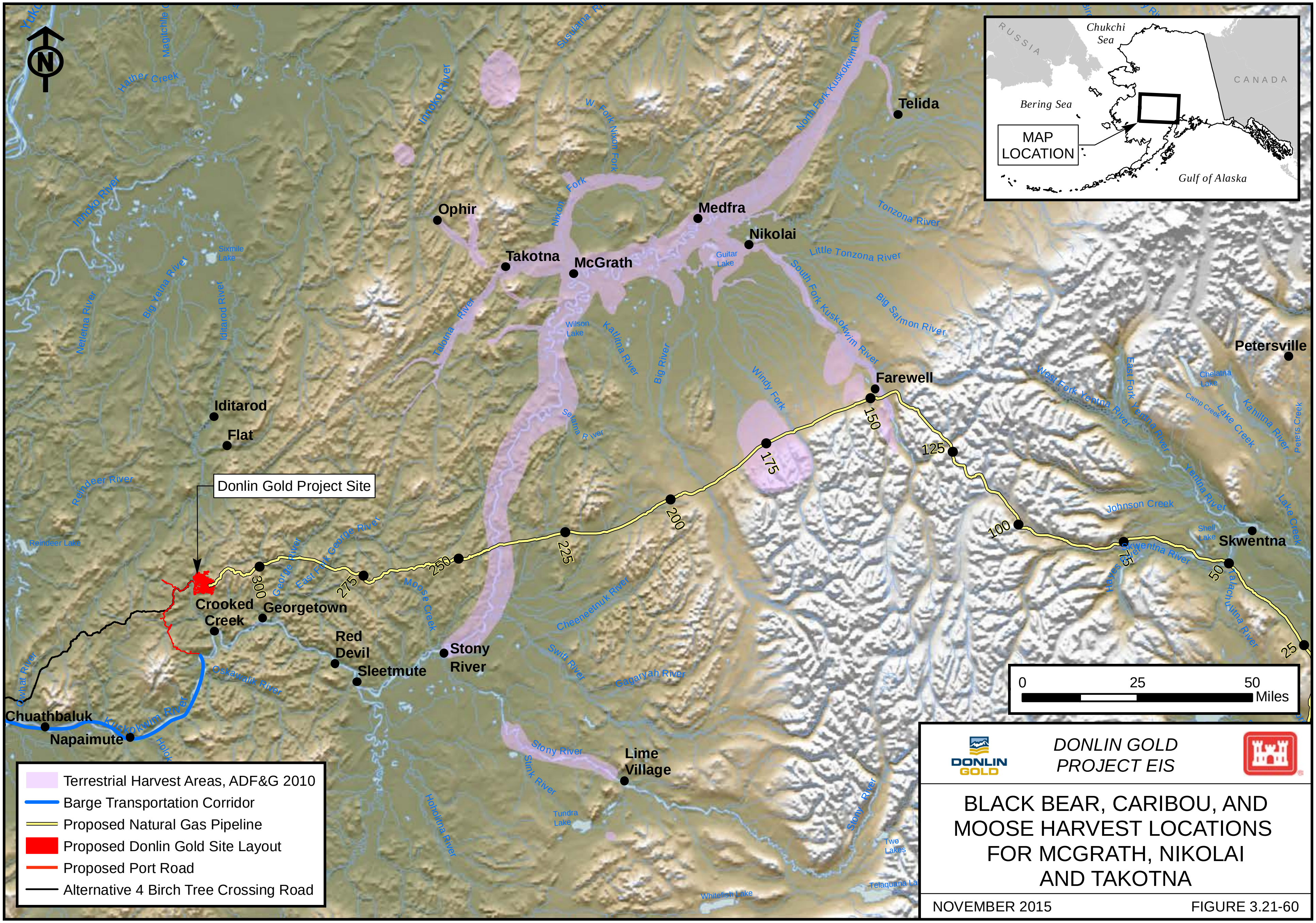
Under Alternative 2, the 315-mile natural gas pipeline would traverse some portion of the subsistence use areas for several villages:

- Crooked Creek, in the George River approximately between MP 270 and MP 290 (see Figure 3.21-51 for moose)
- Stony River, between MP 235 and MP 250 (see Figure 3.21-51 and Figure 3.21-54 for moose and berry harvest areas)
- McGrath, Nikolai, and Takotna in the vicinity of MP 150, MP 175, and MP 240 (see Figure 3.21-60 for black bear, caribou, and moose harvest locations). Figure 3.21-61

displays salmon harvest locations, which are not affected by the pipeline corridor. Figure 3.21-62 displays harvest areas for berries and plants in the vicinity of MP 175

- Skwentna, between approximately MP 50 and MP 75 (see Figure 3.21-63 for black bear, caribou, and moose harvest areas; Figure 3.21-64 for salmon harvest locations; Figure 3.21-65 for bird harvest areas; and Figure 3.21-66 for berries and plant harvest locations)
- Tyonek, between MP 0 and approximately MP5, (see Figure 3.21-63 for black bear, caribou, and moose harvest areas; Figure 3.21-65 for bird harvest areas; and Figure 3.21-66 for berries and plant harvest locations).

The natural gas pipeline would not overlap with salmon fishing areas for any communities except for Skwentna (see Figure 3.21-64).

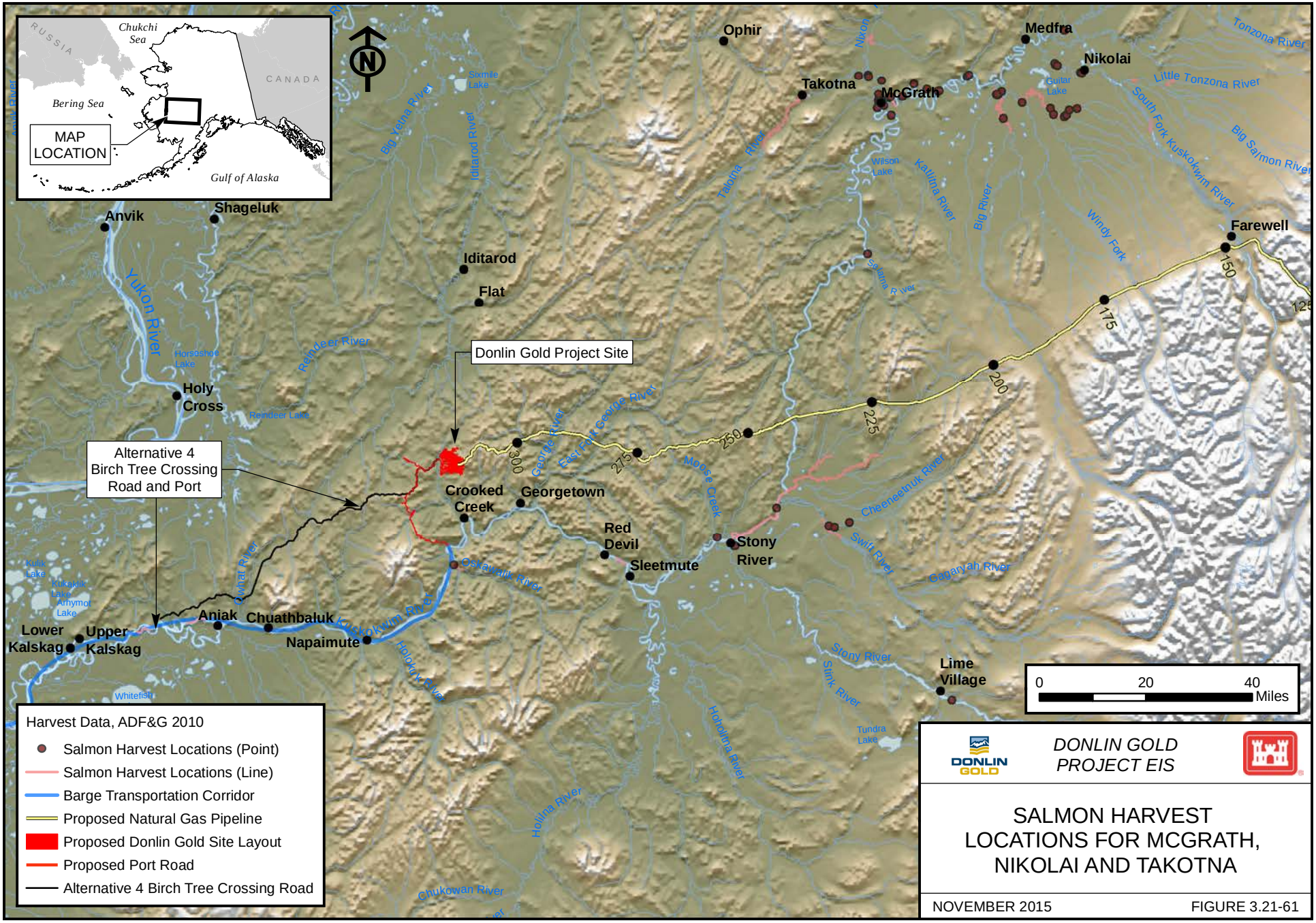


DONLIN GOLD PROJECT EIS

BLACK BEAR, CARIBOU, AND MOOSE HARVEST LOCATIONS FOR MCGRATH, NIKOLAI AND TAKOTNA

NOVEMBER 2015

FIGURE 3.21-60



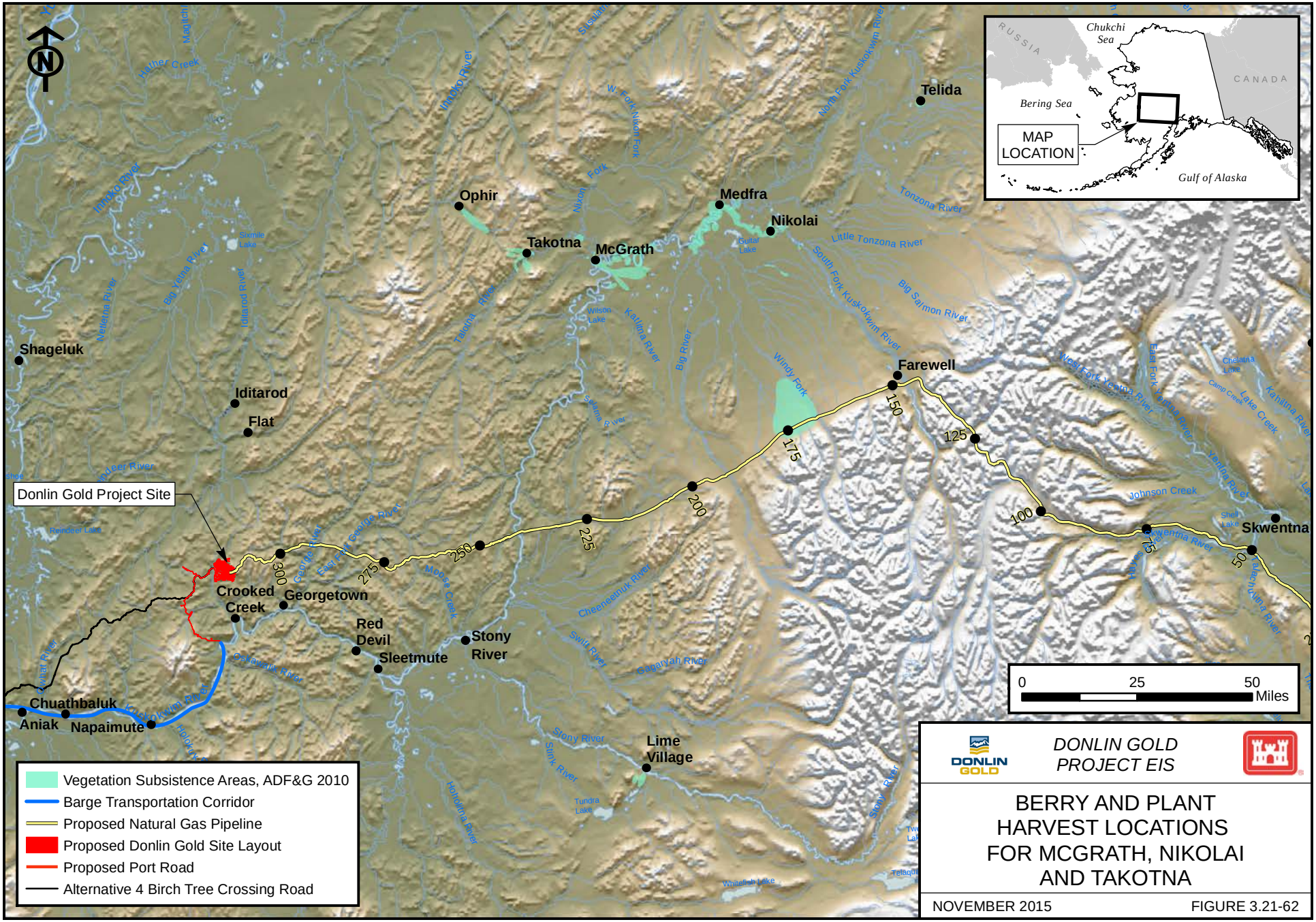
DONLIN GOLD

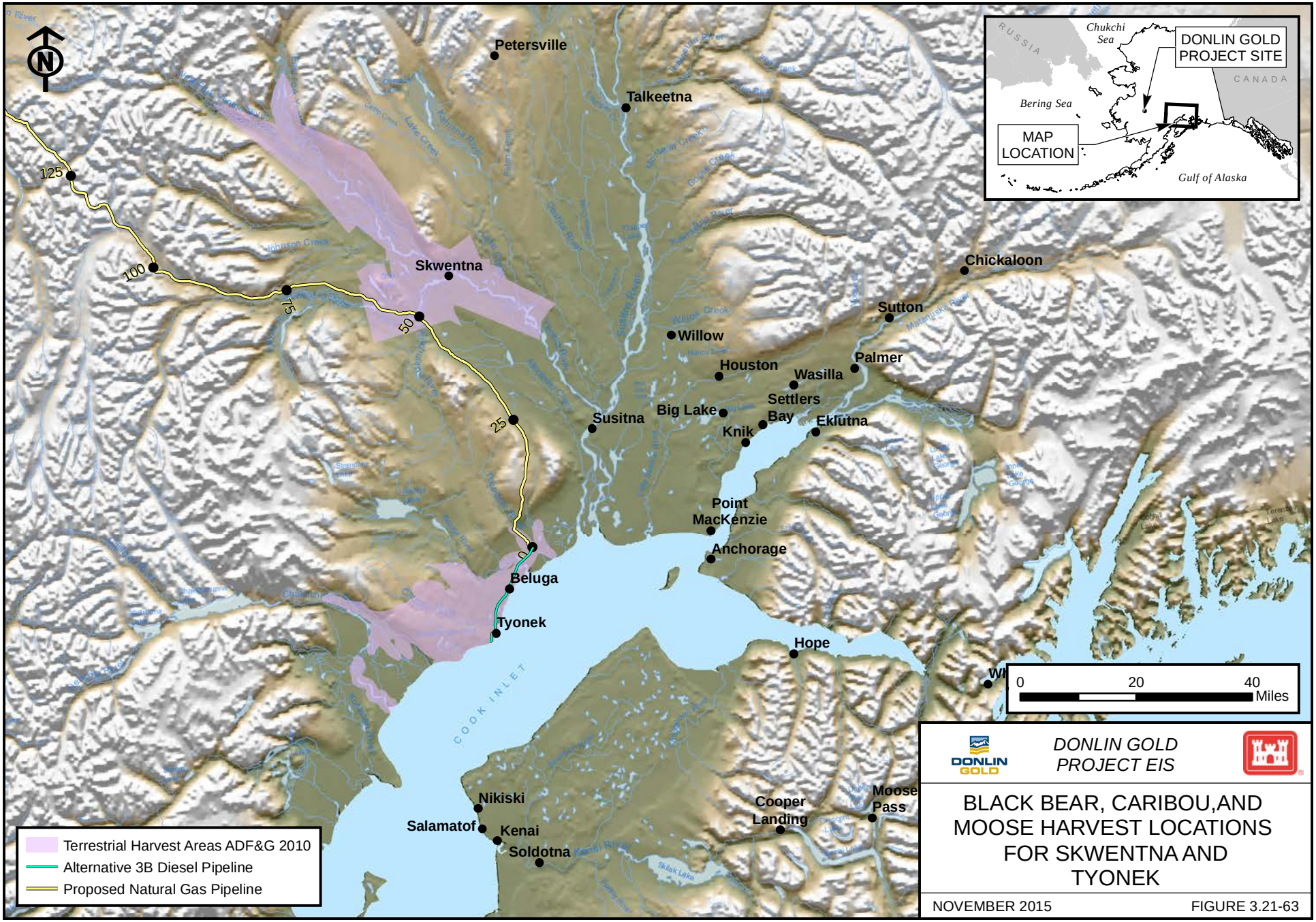
DONLIN GOLD PROJECT EIS

SALMON HARVEST LOCATIONS FOR MCGRATH, NIKOLAI AND TAKOTNA

NOVEMBER 2015

FIGURE 3.21-61


Telida
Ophir
Medfra
Nikolai
Takotna
McGrath
Shageluk
Iditarod
Flat
Farewell
Donlin Gold Project Site
Crooked Creek
Georgetown
Red Devil
Sleetmute
Stony River
Skwentna
Chuathbaluk
Aniak
Napaimute
Lime Village
Chukchi Sea
RUSSIA
CANADA
Bering Sea
MAP LOCATION
Gulf of Alaska
Vegetation Subsistence Areas, ADF&G 2010
Barge Transportation Corridor
Proposed Natural Gas Pipeline
Proposed Donlin Gold Site Layout
Proposed Port Road
Alternative 4 Birch Tree Crossing Road
0
25
50
Miles
DONLIN GOLD
DONLIN GOLD PROJECT EIS
BERRY AND PLANT HARVEST LOCATIONS FOR MCGRATH, NIKOLAI AND TAKOTNA
NOVEMBER 2015
FIGURE 3.21-62



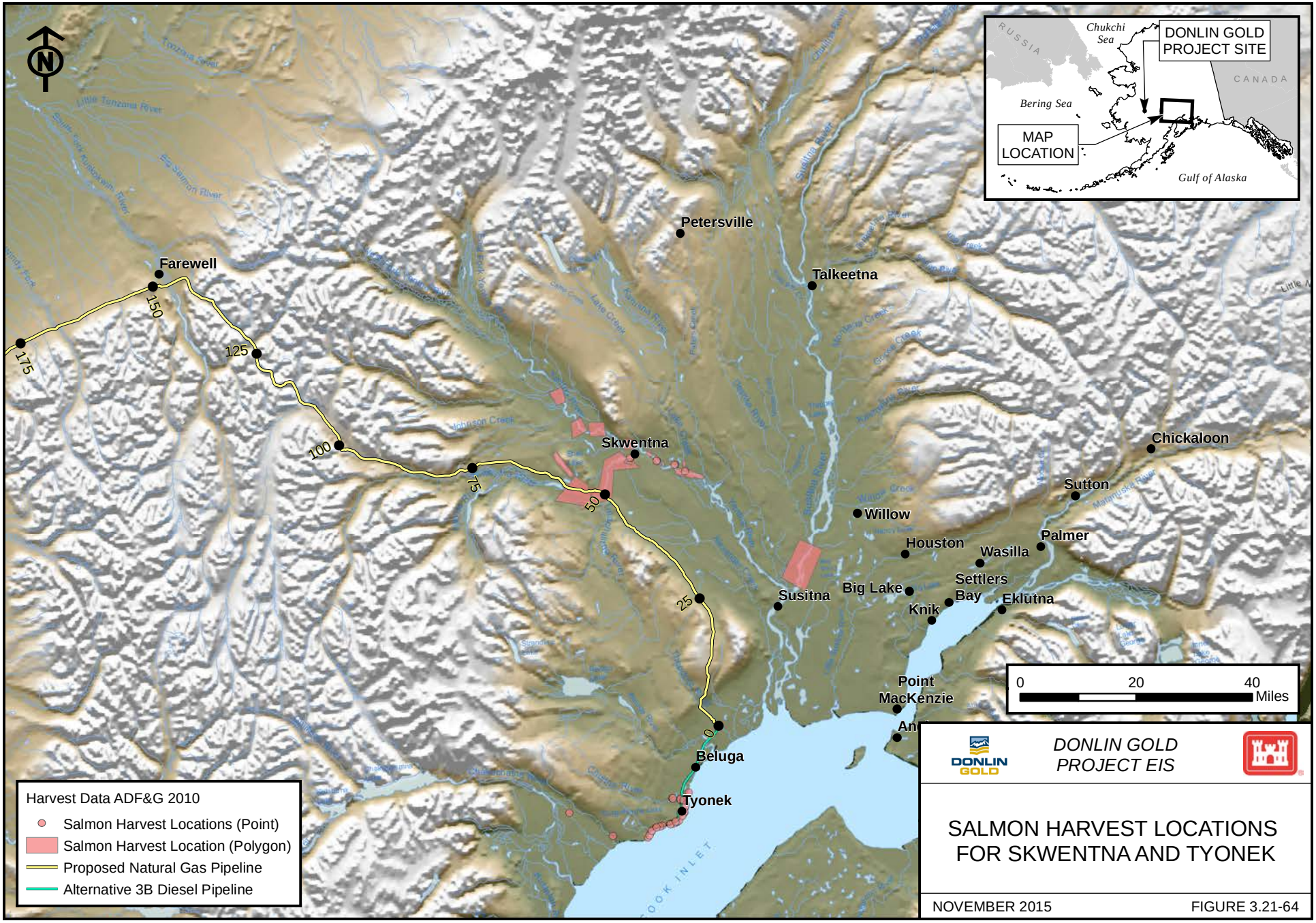
DONLIN GOLD

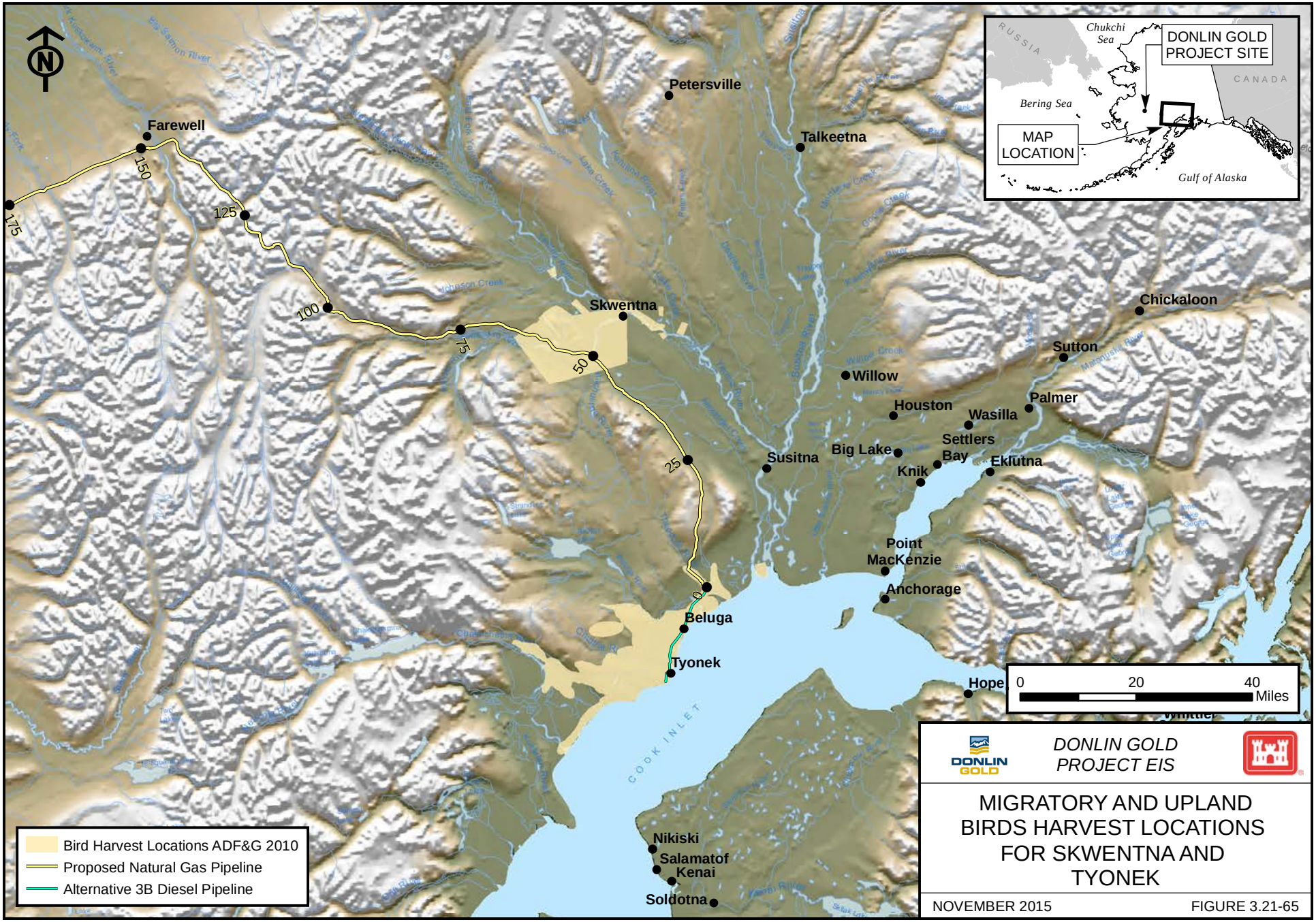
DONLIN GOLD PROJECT EIS

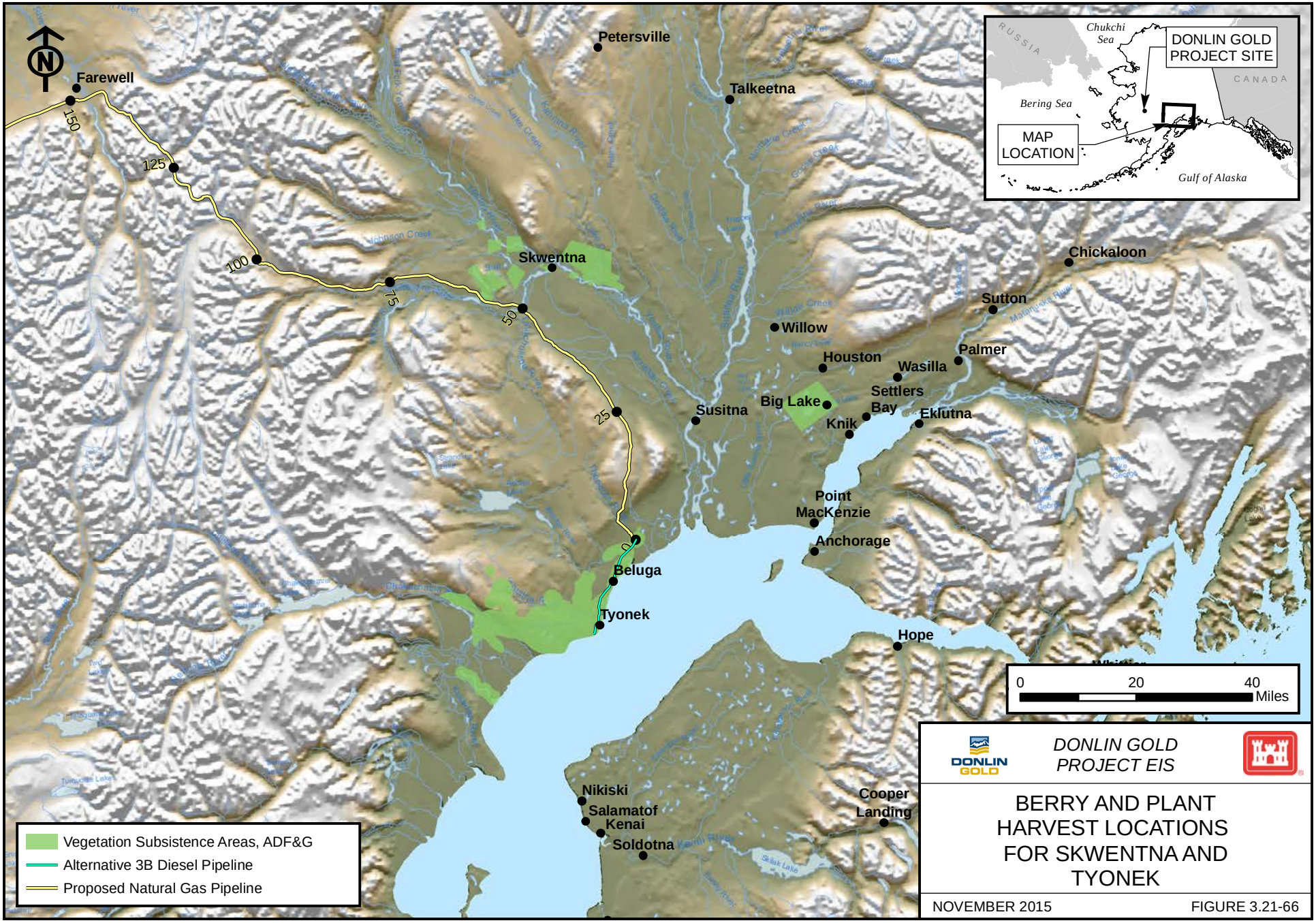
BLACK BEAR, CARIBOU,AND MOOSE HARVEST LOCATIONS FOR SKWENTNA AND TYONEK

NOVEMBER 2015

FIGURE 3.21-63


Petersville
Talkeetna
Farewell
Skwentna
Chickaloon
Sutton
Willow
Houston
Palmer
Wasilla
Settlers Bay
Big Lake
Susitna
Knik
Eklutna
Point MacKenzie
Beluga
Tyonek
175
150
125
100
75
50
25
0
Chukchi Sea
Bering Sea
Gulf of Alaska
RUSSIA
CANADA
DONLIN GOLD PROJECT SITE
MAP LOCATION
0
20
40
Miles
Harvest Data ADF&G 2010
Salmon Harvest Locations (Point)
Salmon Harvest Location (Polygon)
Proposed Natural Gas Pipeline
Alternative 3B Diesel Pipeline
DONLIN GOLD
DONLIN GOLD PROJECT EIS
SALMON HARVEST LOCATIONS FOR SKWENTNA AND TYONEK
NOVEMBER 2015
FIGURE 3.21-64


Farewell
Petersville
Talkeetna
Skwentna
Chickaloon
Sutton
Willow
Houston
Wasilla
Palmer
Settlers Bay
Big Lake
Susitna
Knik
Eklutna
Point MacKenzie
Anchorage
Beluga
Tyonek
Hope
Nikiski
Salamatof
Kenai
Soldotna
175
150
125
100
75
50
25
0
COOK INLET
RUSSIA
Chukchi Sea
Bering Sea
CANADA
Gulf of Alaska
DONLIN GOLD PROJECT SITE
MAP LOCATION
0
20
40
Miles
Bird Harvest Locations ADF&G 2010
Proposed Natural Gas Pipeline
Alternative 3B Diesel Pipeline
DONLIN GOLD
DONLIN GOLD PROJECT EIS
MIGRATORY AND UPLAND BIRDS HARVEST LOCATIONS FOR SKWENTNA AND TYONEK
NOVEMBER 2015
FIGURE 3.21-65


Farewell
Petersville
Talkeetna
Skwentna
Chickaloon
Sutton
Willow
Houston
Palmer
Wasilla
Settlers Bay
Big Lake
Susitna
Knik
Eklutna
Point MacKenzie
Anchorage
Beluga
Tyonek
Hope
Nikiski
Salamatof
Kenai
Soldotna
Cooper Landing
150
125
100
75
50
25
0
RUSSIA
Chukchi Sea
Bering Sea
CANADA
Gulf of Alaska
DONLIN GOLD PROJECT SITE
MAP LOCATION
0
20
40
Miles
Vegetation Subsistence Areas, ADF&G
Alternative 3B Diesel Pipeline
Proposed Natural Gas Pipeline
DONLIN GOLD
DONLIN GOLD PROJECT EIS
BERRY AND PLANT HARVEST LOCATIONS FOR SKWENTNA AND TYONEK
NOVEMBER 2015
FIGURE 3.21-66

The proposed construction schedule shows that Section 6, which includes the subsistence use area of Crooked Creek, would be built during summer; while Section 5, that crosses the subsistence use area of Stony River, would be built during the winter. Section 4, which includes the harvest area of Nikolai, would be built during the winter and completed by April as would Sections 1 and 2 nearest Skwentna. The ROW is relatively narrow as compared to the subsistence areas of these communities, and because most of the construction in these sections would take place primarily during the winter, problems of access to subsistence resources would be reduced. If noise and the presence of humans during construction diverts animals from their normal habitat, or makes them more difficult to approach, hunting may become more difficult. The effect would likely be temporary, limited only to particular sections of the pipeline during construction. Regarding the overlap of the pipeline with Skwentna village fishing area, the Skwentna River crossing would employ Horizontal Directional Drilling and is scheduled for a winter construction sequence, thereby minimizing impacts to fish and subsistence fishing during the open water season.

For this reason the impact from displacement of access is considered low in intensity, short term in duration (the length of construction segment in this area), localized in extent, and affecting common resources and subsistence practices that are unique. Donlin Gold intends to work with people to either allow controlled access through or within construction zones, or to provide alternate access.

Effects from Changes in Access to Subsistence Resources (Operations and Maintenance; and Closure, Reclamation, and Monitoring)

During operations, the natural gas pipeline would be buried, with minimal above-ground infrastructure. The pipeline ROW would not be fenced, so there would be no obstruction to subsistence users traversing the ROW. There would be no permanent road alongside the pipeline, and all above-ground infrastructure would be dismantled and removed following operations. The effects of operations and closure would be of low intensity and localized in extent. Effects would be long-term in duration (life of the project), and resources affected are considered common in context.

Effects from Changes in Competition for Subsistence Resources (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

Pipeline construction would not be expected to directly increase external competition for subsistence resources from project employees. However, as an indirect effect, once construction is completed, construction-related transportation improvements where retained after construction (i.e., Farewell Airstrip), and the cleared pipeline corridor itself may increase out-of-region competition for subsistence resources. Construction workers would be prohibited from having firearms or hunting from their project workplaces. Their exposure to potentially new hunting areas could indirectly lead to an increase in hunting pressure following the construction period.

This is a major concern of local residents who think that infrastructure developed to support pipeline construction would offer enhanced opportunities for non-locals to access the area. Given the distance from population centers and access points, and the lack of surface transportation improvements, it is unlikely that ATV traffic from the west side of Cook Inlet would reach the subsistence use areas of communities of the EIS Analysis Area as a result of the

pipeline ROW. Winter access by snowmachine is currently possible via the Iditarod National Historic Trail, but given the distances involved, the likely use by new recreational hunters entering the subsistence use areas west of the Alaska Range is very low. The temporary airstrips used during construction would be demobilized.

Local residents cite various instances where non-locals currently use remote airstrips, such as Farewell, to gain access to hunt. Non-local hunters also fly ATVs to this airstrip and trails extend out from the airstrip for many miles. As expressed in meetings, this is a concern of local people, particularly residents of Nikolai who have hunting camps in the vicinity of the pipeline ROW (URS 2014e). If temporary airstrips used for construction are not adequately demobilized, or if pilots find the cleared ROW attractive for landing on tundra tires, then, as noted in Section 3.12.3.2.2, Wildlife, this may present the "largest potential impact" of the pipeline on terrestrial mammals during the operations phase. With appropriate demobilization of the temporary airstrips, the effects of competition could be reduced. The overall effects of the natural gas pipeline construction, operations, and closure on competition over wildlife resources would be considered low to medium, based on growing interest in access for airborne hunters and trappers. Effects would be localized, in the vicinity of the Farewell airstrip, and potentially along the cleared ROW from Farewell west to the uplands of the Windy Fork and Big River. The effects would be of long-term duration and affect common resources and subsistence practices that are unique in context.

Effects from Changes in Socio-cultural Aspects of Subsistence (Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring)

The socio-cultural effects of pipeline construction would be the same as those associated with employment at the mine site.

Summary for Alternative 2 – Natural Gas Pipeline

The residents of Stony River, Skwentna, and Nikolai could experience low intensity effects on subsistence resources and access to subsistence resource areas that overlap with the pipeline corridor during construction. The resources affected are locally abundant, and common in context. During construction, the effects would be of low intensity in a limited area near the ROW, and short-term in duration, coinciding with the presence of machinery, pipe, workers, and infrastructure on or near the ROW. The geographic extent of impacts would be localized to construction areas, but arrayed along a 315-mile pipeline ROW. Pipeline construction infrastructure, such as remote airstrips and access roads, would be demobilized following construction reducing the potential for increased access to subsistence resources by non-local residents and competition within the subsistence areas adjacent to the ROW. However, greater exposure to the region and increased access for airborne hunters and trappers at Farewell airstrip and along the cleared ROW north and west of the Alaska Range could result in a moderate increase in competition, affecting the residents of McGrath, Nikolai, and Takotna, since their subsistence use area includes the Farewell vicinity. Impacts during operations and closure activities would be low in intensity, long–term in duration (length of the project), and localized to the ROW affecting common resources and subsistence practices that are unique in context.

3.21.6.3.4 CLIMATE CHANGE

The proposed project would contribute to climate change as discussed in Section 3.8, Air Quality, through production of greenhouse gasses. The level of greenhouse gas emissions generated by implementation of Alternative 2 is not likely to create climate change effects to subsistence. However, if current climate change trends continue, then the impacts to key subsistence resources, such as salmon, moose, and waterfowl, will continue to be affected as described in Section 3.26, Climate Change.

3.21.6.3.5 SUMMARY FOR ALTERNATIVE 2 – ALL COMPONENTS

From the mine site component, the summary impact to subsistence practices would be minor, except for moderate beneficial effects from new employment and income (Table 3.21-23). The intensity of impacts range would be low for changes due to alterations in resources, access, and competition. Impacts to Crooked Creek use areas near the mine site would be higher than other communities (i.e., low) since the mine site of about 25 square miles would be displaced from use relative to a total subsistence use area for this community of 1,246 square miles, and about 5 percent of the mapped berry picking area would be disturbed by the port and the mine access road. Intensity of socio-cultural impacts would be rated low to medium beneficial impacts from income, affecting 25 to 29 percent of area households during construction and 5 to 9 percent of households during operations, with higher percentages likely in the smaller Central Kuskokwim villages near the mine site. The intensity of effects for outmigration and rotational shift work are rated low to medium and adverse, estimated to affect about half of the households with employment at the Donlin Gold Project. Impacts are general long-term through the life of the mine, except that disturbance associated with the pipeline construction period is greater for a limited period. Geographic extent is generally regional, and the resources and subsistence practices affected are generally important. The socio-cultural features of subsistence communities are unique in context.

For the transportation facilities, the summary impact would be minor, except moderate for subsistence fishing in the narrow reaches of the Kuskokwim River (Table 3.21-23). The intensity of impacts is low to medium, with the higher rating resulting from potential disturbance to subsistence fishing in the narrower, more shallow reaches of the Kuskokwim River. Socio-cultural impacts attributable to the transportation facilities are the same as those for the mine site. The effects are long term, lasting through the construction and operations period. The extent is regional, since the transportation activities extend from the mouth of the Kuskokwim River to the Angyaruaq (Jungjuk) Port. The resources and practices affected are generally important in context, particularly in regard to Chinook salmon and moose, which have been the objects of exceptional conservation measures in recent years. The socio-cultural features of subsistence communities are unique in context.

For the natural gas pipeline, summary impacts to subsistence practices are minor, except moderate for the communities of McGrath, Nikolai, and Takotna due to increased competition near and west of the Farewell Airstrip (Table 3.21-23). The rating combines low intensity effects from changes in resources and access with the medium intensity increase in competition near the Farewell airstrip. Socio-cultural impacts attributable to the transportation facilities are the same as those for the mine site. The effects are long-term in duration, and generally local in extent, affect small discrete, areas along the pipeline ROW. The resources affected are generally

important in context, except that the socio-cultural features of subsistence communities are unique.

These effects determinations take into account impact reducing design features (Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) proposed by Donlin Gold and also the Standard Permit Conditions and BMPs (see Section 5.3 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) that would be implemented. Several examples of these are presented below.

Design features most important for reducing impacts to subsistence include:

- Agreements with Alaska Native land owners create contractual commitments to shareholder hire and revenue flows for Alaska Native shareholders.
- Donlin Gold would implement a no hunting/fishing policy for employees at work sites to minimize competition from employees for local resources.
- The project design includes the development and implementation of a Construction Communications Plan to inform the public and commercial operators of construction activities.
- The project design includes shift work schedules to maximize opportunities for employees to remain active in subsistence harvest efforts during construction and operations phases
- Ocean and river fuel barges would be double hulled and have multiple isolated compartments for transporting fuel to reduce the risk of a spill.
- The project design includes a communication program in communities to keep local communities informed of the schedules and current status of barge traffic as well as minimize displacement of subsistence fishing by barges.
- Additional design features reduce impacts to wetlands and vegetation and contribute to maintaining habitat for subsistence resources. Others reduce disturbance and displacement, or to reduce spill risks to fish and wildlife used for subsistence. See Table 5.2-1 for details.

Standard Permit Conditions and BMPs important for reducing impacts to subsistence include:

- Protection of the habitat of subsistence resources through Erosion and Sediment Control Plan and Storm Water Pollution Prevention Plans prior to the commencement of ground disturbance activities.
- Spill prevention and response type plans as required by federal and state requirements. The plan(s) will prescribe effective processes and procedures to prevent the spill of fuel or hazardous substances and include procedures to respond to accidental releases.
- Use of BMPs such as watering and use of dust suppressants to control fugitive dust and to avoid impacts on subsistence berry picking activities.

Table 3.21-23: Alternative 2 Impact Levels by Project Component

Impact Type	Impact Level				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating[1]
Mine Site					
Effects due to Changes in Resource Abundance and Availability	Low for Crooked Creek residents and Bering Sea Coast waterfowl harvesters (due to perceived, but not actual, contamination) during construction and operations No impact for other communities. Low After Closure	Long-term, except Permanent for perceived risk of waterfowl contamination	Local, except Regional for perceived risk of waterfowl contamination	Common, except important for harvests of Chinook salmon and waterfowl	
Effects Due to Changes in Access	Low for Crooked Creek residents during construction and operations; No impact for other communities Low after Closure	Same as above	Same as above	Same as above	
Effects Due to Changes in Competition	No impact from non-local mine employees; Unpredictable timing and intensity for renewed in-region competition for moose and Chinook salmon, due to new employment and incomes	Same as above	Regional	Important	
Socio-cultural Effects on Subsistence	Medium (beneficial) from rising employment income in Central Kuskokwim sub-region; Low (beneficial) elsewhere; Low to Medium adverse effect for out-migration and rotational work schedules After Closure: Low from loss of income	Same as above	Regional	Unique	

Table 3.21-23: Alternative 2 Impact Levels by Project Component

Impact Type	Impact Level				
	Magnitude or Intensity	**Duration**	**Geographic Extent**	**Context**	**Summary Impact Rating[1]**
Summary	Low for resource availability, access, and competition; Low to Medium beneficial impacts from employment and incomes; Low to Medium adverse impacts due to out-migration and rotational shift work.	Long-term	Regional due to competition and socio-cultural practices	Important	Minor, except Moderate beneficial income effect
Transportation Facilities					
Effects due to Changes in Resource Abundance and Availability	Low; except Low to Medium for subsistence fishing based on fish in narrow reaches of the Kuskokwim River After closure, Low	Long-term	Regional	Common, except Important for Chinook salmon fishing and moose hunting.	
Effects Due to Changes in Access	Low from mine access road and barge traffic, except Medium for Crooked Creek residents' fish camps and fishing locations just below Angyaruaq After closure, Low and beneficial due to improved access from the mine access road	Long-term, seasonal disturbances on mine access road and river corridor during the open-water summer transportation season	Regional	Common, except important for fish camps near Angyaruaq	
Effects due to Changes in Competition	Same as mine site	Long-term	Regional	Important	
Socio-cultural Impacts	Same as mine site	Long-term	Regional	Unique	

Table 3.21-23: Alternative 2 Impact Levels by Project Component

Impact Type	Impact Level				
	Magnitude or Intensity	**Duration**	**Geographic Extent**	**Context**	**Summary Impact Rating[1]**
Summary	Low to Medium	Long-term	Regional	Important	Minor, except Moderate for displaced fish camp near Angyaruaq (Jungjuk) and for subsistence fishing in narrow reaches of the Kuskokwim River
Pipeline					
Effects due to Changes in Subsistence Resources	Construction: Low for fishing and hunting Operations and Closure: Low.	Temporary for construction, Long-term for operations and closure	Local	Common	
Effects Due to Changes in Access	Low during Construction, Operations, and Closure	Same as above	Same as above	Same as above	
Effects due to Changes in Competition	Low, except Medium in vicinity of Farewell Airstrip	Long-term during operations and closure	Local	Important	
Socio-cultural Impacts	Same as mine site	Same as mine site	Same as mine site	Same as mine site	
Summary	Low	Long-term	Local	Important	Minor, except Moderate due to increased competition near Farewell Airstrip area

Notes:
1 The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation measures the Corps is considering.

3.21.6.3.6 ADDITIONAL MITIGATION AND MONITORING FOR ALTERNATIVE 2

The Corps is considering additional mitigation to reduce the effects presented above (Table 5.5-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation). These include many proposed measures to further reduce impacts to vegetation and wetlands (i.e., fish, and wildlife habitat), disturbance and displacement of fish and wildlife resources used for subsistence, and spill risks to subsistence resources. Specific measures related to subsistence harvest practices include:

- Donlin Gold should use current information and traditional knowledge to identify locations and times when subsistence activities occur; and to the extent practicable, minimize impacts to these activities.
- During project construction, operations, and closure, communication between Donlin Gold and subsistence users to ensure dissemination of factual information concerning actual ecological risks and potential exposure of waterfowl to contamination is important to address concerns and perceptions about contamination. This may include monitoring and testing of bird carcasses, if appropriate.
- Two way communications strategy should be implemented that keeps local communities informed of the schedules and current status of barge traffic, and keeps Donlin informed of the location and timing commercial and subsistence fishing activities. Plan of communication needs to include Bethel, as there is a lot of traffic moving through Bethel Port.

The additional measures would reduce impacts or uncertainties. However, the degree of reduction would not be so great as to change ratings from the low to moderate effects identified in Table 3.21-23.

3.21.6.4 ALTERNATIVE 3A – REDUCED DIESEL BARGING: LNG-POWERED HAUL TRUCKS

Under Alternative 3A, LNG-powered haul trucks would replace diesel powered haul trucks, thereby reducing diesel fuel transportation and use at the mine site. Total river barge traffic, including fuel and supply barges, would see a 32 percent reduction, from approximately 122 annual round trips in Alternative 2 to 83 trips in Alternative 3A. As shown in Table 3.21-24, this is due to the reduction in the annual number of fuel barge round trips on the Kuskokwim River by 67 percent (from 58 per year to 19 per year).

Table 3.21-24: Annual Barge Traffic Comparisons: Alternatives 2 and 3A

	Alt 2	Alt 3	Difference
Cargo	64	64	0%
Fuel	58	19	-67%
Total	122	83	-32%

This reduction in river barge traffic would reduce by about one-third the potential effects on riverine habitat and subsistence resources, potential barge interference with subsistence fishing gear, fish camps, and processing rafts. The reduction would translate into larger time intervals

between barges. Under Alternative 2, it was estimated that 2-3 barge passings would occur per day, or at an interval of about 8 to 12 hours between passings. Under Alternative 3, total annual barge round trips would be reduced to 83, representing 166 one-way trajectories. In the 110-day barging season, this would result in 1-2 barge passings per day, with an interval of 12-24 hours between barge passings.

Direct and indirect effects on subsistence uses from changes in subsistence resources and access to subsistence resources in the vicinity of the mine site and along the pipeline route would be the same as in Alternative 2, since there would be no change in the pipeline or mine associated with Alternative 3A. Competition for resources and socio-cultural impacts to subsistence practices would be the same as Alternative 2. Taking into account reduced barge traffic, the resulting impact would be low in intensity, long-term in duration, regional in extent (along the Kuskokwim River barging corridor) and affecting resources that are common in context, except for Chinook salmon, which are important due to urgent conservation measures in recent years. The summary effect of Alternative 3A on subsistence is reduced to minor, due to the reduction in barge traffic.

Impacts associated with climate change would also be the same as discussed for Alternative 2.

The effects determinations take into account applicable impact reducing design features, and BMPs and standard permit conditions as discussed in Alternative 2.

The effect of additional mitigation measures considered by the Corps would be the same as discussed in Alternative 2.

3.21.6.5 ALTERNATIVE 3B – REDUCED DIESEL BARGING: DIESEL PIPELINE

Under Alternative 3B, an 18-inch diameter buried diesel pipeline would be constructed instead of transporting diesel fuel by barge on the Kuskokwim River. The diesel pipeline would be installed in the same ROW as the natural gas pipeline under Alternative 2, except that an additional 18-mile segment would be needed to reach a diesel fuel dock at the Tyonek North Foreland Facility. The existing fuel dock would be modified to receive an estimated 12 tankers per year, delivering the annual supply of 120 Mgal of diesel to be transported through the pipeline to the proposed Donlin Gold mine site (Section 2.3.4, Chapter 2, Alternatives).

This action would eliminate all barge traffic necessary to transport diesel fuel to the mine site. As shown in the following table, without fuel barging, the barging activity would consist of 64 round trips per year for cargo, instead of 122 round trips, a reduction of 48 percent.

Table 3.21-25: Annual Barge Traffic Comparisons: Alternatives 2 and 3B[1]

	Alt 2	Alt 3	Difference
Cargo	64	64	0%
Fuel	58	0	-100%
Total	122	64	-48%

Notes:
1 Expressed in number of round trips

Since barging accounts for a large portion of all impacts to subsistence fishing from the project, the effects of Alternative 3B to subsistence resources and access to subsistence resources along the Kuskokwim River corridor would be reduced by about half. Estimated barge passings would total 64 round trips or 128 one-way trajectories per season, which would yield an average of just over 1 to 1.5 passings per day (during the 110-day season). This would result in intervals of about 16 to 20 hours between passings. The intensity of impacts on subsistence fishing would be reduced to low.

The diesel tanker traffic to the modified Tyonek North Forelands Facility would increase the potential for disturbance or collisions, but the occurrence of marine mammals in that area is low (Section 3.12.4.2.4, Wildlife). As a result, impacts to marine mammal hunting by Tyonek residents are estimated to be of low intensity, for the long-term duration of the project, localized in extent, and affected resources include beluga whales, that are unique in context, due to their status of the ESA.

Portions of the temporary gravel access roads developed during construction would be left in place to provide increased spill response capabilities after construction. This alternative would require additional airstrips and staging areas for pipeline construction, and most of the airstrips would need to be left in place throughout the operating life of the pipeline for diesel spill response capacity. For comparison to Alternative 2, Table 2.3-28 lists the three existing, and nine temporary new airstrips for construction under alternative 2, and Figure 2.3-27 shows the locations (see Chapter 2, Alternatives). For Alternative 3B, Table 2.3-36 lists 30 airstrips for diesel pipeline spill response Alternative 3B). This list includes the airstrips used in construction of Alternative 2, plus three new Donlin-proposed Airstrips: Puntilla and MP 108, Tatlawiksuk at MP 220, and George River at MP 276. In addition, for Alt 3B, the list of airstrips for spill response includes 14 existing airstrips, most of them in communities within the EIS Analysis Are, such as Tyonek, Skwetna, Nikolai, McGrath, Red Devil, and Aniak. The 12 new airstrips (9 used in construction under Alt 2, and 3 proposed for installation under alt 3B) represent many new points of potentially long-term access, some of which fall in or near document subsistence use areas. The following community subsistence use areas may be affected by the proximity of the associated airstrips and gravel access roads retained after construction:

- Skwentna: MP 42 Deep Creek airstrip and MP 54 Shell airstrip
- McGrath, Nikolai, and Takotna – MP 158 Farewell airstrip (as in Alternative 2)
- Central Kuskokwim villages – MP 235 Kuskokwim East airstrip and MP 246 Kuskokwim West airstrip
- Crooked Creek – MP 276 George River airstrip

The level of use and resulting competition by non-local hunters would be greater and longer lasting than under Alternative 2. The magnitude is estimated at medium.

The estimated impacts to subsistence activity from changes in resources, access, competition, and socio-cultural patterns during construction, operations, and closure of the mine site under Alternative 3B would be the same as those described under Alternative 2. For the diesel pipeline, the overall effects of the construction, operations, and closure under Alternative 3B would generally be the same as those described for the Alternative 2 natural gas pipeline, despite the nominal difference in pipeline diameter. However, the long-term availability of new airstrips and gravel access road would increase competition for some communities to medium. The summary effect of Alternative 3B on subsistence is less than that of Alternative 2, i.e., minor, due to the scale of reduction in barge traffic on the Kuskokwim River.

Impacts associated with climate change would also be the same as discussed for Alternative 2, although the decrease in barging would slightly reduce contributions to greenhouse gasses, while burning diesel rather than natural gas at the electrical generating power plant would have slightly increased emissions of greenhouse gases.

The effects determinations take into account applicable impact reducing design features, and BMPs and standard permit conditions as discussed in Alternative 2.

The effect of additional mitigation measures considered by the Corps would be the same as discussed in Alternative 2.

3.21.6.6 ALTERNATIVE 4 – BIRCH TREE CROSSING (BTC) PORT

Under Alternative 4, the upriver port site would be located at BTC, 124 river miles upstream from Bethel, 14 river miles below Aniak, and 75 river miles below the proposed Angyaruaq (Jungjuk) Port site. The mine site and natural gas pipeline components would be the same as those in Alternative 2, and the impacts of those two project components would be the same as in Alternative 2.

For the transportation facilities component, under Alternative 2 the distance travelled by barges along the river to BTC would be 124 miles, a 38 percent reduction in distance. The number of barge trips would be the same at 122 round trips annually. The road from BTC to the mine site would be approximately 76 miles long, compared to 30 miles for the mine access road from Angyaruaq (Jungjuk), an increase in distance of 253 percent (see Table 3.21-26 below). The BTC mine access road would cross subsistence hunting areas for moose, caribou, and black bear as well as areas for harvesting berries for many Central Kuskokwim River communities (see Figure 3.21-51 and Figure 3.21-54).

Table 3.21-26: Annual Transportation Distances Comparisons: Alternatives 2 and 4

	Alt 2 – River miles	Alt 4 – River miles	Difference in River Miles	Difference in %
Barge	199	124	-75	-38%
Mine Access Road	30	76	46	253%

Alternative 4 substitutes the effects of the reduced river transportation distance for the potential effects from a longer mine access road. Effects of reduced river barge transportation distance include reduced disturbance and spill risk, while the effects of the longer mine access road include more habitat displacement and disturbance from increased vehicle traffic. Habitat disturbance would be local in extent, confined to the BTC road alignment and scattered sites supporting construction. The activities during the construction period could temporarily displace wildlife or otherwise affect animal behavior, thus making it more difficult for subsistence hunting in the areas where subsistence users currently go (Section 3.12.3.2.4, Wildlife). Since construction of the BTC Port site and access road is planned for completion in less than 2 years, impacts to subsistence resources during construction would be of low intensity, temporary or short-term in duration, and localized. The resources affected would be common in context, except for moose which are important in context.

The road from the BTC site would cross the Owhat River watershed, which is an important area for subsistence activities by residents from several communities (URS 2014e). Access to subsistence resources would likely be reduced during the summer period of road operations since hunting and trapping could be prohibited in the immediate vicinity of the road. While use of the road would be restricted to the industrial purpose of transportation to the mine, there would be no prohibition on other users crossing the road. The BTC Port site would also displace set net and drift net fishing locations opposite the downstream mouth of Aniak Slough (Figure 3.21-57A). The overall effect on access to subsistence resources would be low considering that the BTC Road bisects only a portion of the traditional use area of Aniak and Chuathbaluk. The effects on access to subsistence fishing sites could be higher in intensity as there are few good drift net locations.

The effects of the longer mine site road and the BTC Port on habitat that supports subsistence activities would be considered permanent, given Donlin Gold's intent to maintain the port and mine site road indefinitely to support monitoring efforts after the mine is closed. Upon closure, access to subsistence resources would increase, since the road would not be closed to other users. The geographic extent is local and the context is common, affecting local available resources. Competition for resources and socio-cultural impacts to subsistence would be the same as Alternative 2. The summary impact of Alternative 4 on subsistence would be minor, with lower intensity of effects to fish and subsistence fishing due to a 39 percent reduction in barging distance, (affecting the villages from Aniak to Crooked Creek), while impacts from the BTC Port and road would be greater than those of the shorter mine access road from the Angyaruaq (Jungjuk) Port.

Impacts associated with climate change would also be the same as discussed for Alternative 2.

The effects determinations take into account applicable impact reducing design features, and BMPs and standard permit conditions as discussed in Alternative 2.

The effect of additional mitigation measures considered by the Corps would be the same as discussed in Alternative 2.

3.21.6.7 ALTERNATIVE 5A – DRY STACK TAILINGS

The primary objective of the "dry stack" process is to reduce the potential for tailings water to inadvertently escape the tailings storage facility. Under routine operations of Alternative 2, no water that has been in contact with mining activities would be discharged. However,

Alternative 5A would result in a different set of environmental risks and benefits, as well as operational challenges as noted in Section 2.3.6.1. The tailings would be deposited as partially saturated, compactable filter cake, which adds an additional margin of safety in reducing risk of tailings spill. An operating pond is also required, which entails risks of dam failure. Given the monitoring, cleanup, and restoration requirements for a permitted mine facility, the potential for exposure of subsistence resources to toxic water sources downstream from the mine site would be slightly lower under Alternative 5A than Alternative 2.

Under routine operations, Alternative 5A would have the same direct and indirect effects on subsistence resources, access, competition, and socio-cultural practices as Alternative 2. Spill risk and consequences are analyzed in Section 3.24, Spill Risk.

Impacts associated with climate change would also be the same as discussed for Alternative 2.

The effects determinations take into account applicable impact reducing design features, and BMPs and standard permit conditions as discussed in Alternative 2.

The effect of additional mitigation measures considered by the Corps would be the same as discussed in Alternative 2.

3.21.6.8 ALTERNATIVE 6A – MODIFIED NATURAL GAS PIPELINE ALIGNMENT: DALZELL GORGE ROUTE

For the mine site and transportation facilities, the potential direct and indirect impacts to subsistence resources or uses of those resources during construction, operations, and closure under Alternative 6A would be the same as those described under Alternative 2.

For the natural gas pipeline component, Alternative 6A would follow an alternative alignment in the Alaska Range, from about MP 107 to MP 152. Since this is well outside of the subsistence use area of Skwentna, the closest community, this variation in alignment would not change the subsistence impacts identified for the natural gas pipeline under Alternative 2.

Impacts associated with climate change would also be the same as discussed for Alternative 2.

The effects determinations take into account applicable impact reducing design features, and BMPs and standard permit conditions as discussed in Alternative 2.

The effect of additional mitigation measures considered by the Corps would be the same as discussed in Alternative 2.

3.21.6.9 IMPACT COMPARISON – ALL ALTERNATIVES

A comparison of the impacts to recreation by alternative is presented in Table 3.21-27.

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Table 3.21-27: Comparison of Impacts by Alternative*

Quantities									
	Cook inlet Tyonek (2006)	**Upper Kuskokwim Nikolai (2011)**	**Central Kuskokwim Crooked Creek (2008)**	**Lower Mid-Kuskokwim Kwethluk (2010)**	**Lower Kuskokwim Quinhagak (1982)**	**Bering Sea Coast Hooper Bay (1984)**	**Mouth of the Yukon Emmonak (2008)**	**Lower Yukon Russian Mission (2011)**	**Middle Yukon Grayling (2011)**
Top 10 species and percent of total harvest	Chinook Salmon - 55% Coho Salmon – 11% Sockeye Salmon 4% Other Fish – 5% Moose and other large land mammals – 18% Marine Mammals – 2% Birds and Eggs – 1% Vegetation – 3 %	Moose – 47% Chinook Salmon – 18% Northern Pike – 5% Coho Salmon – 4% Sheefish – 4% Chum Salmon 3% Humpback Whitefish – 3% Black Bear – 2% Beaver – 2% Bering cisco 1% Other resources -11%	Chinook Salmon – 28% Chum Salmon – 20% Coho Salmon – 13% Sheefish – 9% Sockeye Salmon – 8% Moose – 7% Beaver – 3% Black bear – 3% Crowberry – 2% Blueberry – 1% Other resources – 6%	Chinook salmon – 20% Sockeye Salmon – 10% Chum Salmon – 10% Humpback Whitefish – 10% Northern Pike – 9% Moose – 7% Caribou – 6% Coho Salmon – 6% Bearded Seal – 3% Salmonberry – 2% Other resources – 17%	Chinook - 18% Dolly Varden – 15% Chum Salmon – 10% Coho Salmon – 10% Caribou – 8% Walrus – 6% Sockeye Salmon – 6% Spotted Seal – 5% Moose – 4% Birds and eggs – 4% Other resources – 13%	No Quantitative Data Available	Chum salmon – 26% Moose – 26% Sheefish – 6% Bearded Seal – 5% Beluga – 5% Coho Salmon – 4% Broad Whitefish – 1% Burbot – 2% Northern Pike – 2% Other resources – 15%	Moose – 31% Chinook salmon 22% Summer chum salmon – 7% Arctic lamprey – 8% Northern pike – 7% Humpback whitefish – 4% Sheefish – 3% Fall chum salmon – 2% Burbot – 3% Coho salmon – 2% Other resources – 11%	Chinook Salmon – 27% Moose – 24% Summer Chum Salmon – 12% Beaver – 6% Fall Chum Salmon – 5% Broad Whitefish – 5% Sheefish – 7% Coho Salmon – 4% Humpback Whitefish 2% Pike – 2% Other resources – 8%
Subsistence Production: Estimated annual pounds per capita	Tyonek: 217 pounds Range from 204 pounds in Beluga to 217 in Tyonek	Nikolai: 499 pounds Range from 161 pounds in Takotna to 936 in Lime Village	Crooked Creek: 245 pounds Range from 187 in Lower Kalskag to 532 in Stony River	Kwethluk: 364 pounds Range from 168 in Bethel, to 1328 for Akiachak	Quinhagak: 768 pounds Range from 494 in Napakiak to 1266 for Tuntutuliak	No Quantitative Data Available	Emmonak: 482 pounds Range from 482 for Emmonak to 1393 for Nunam Iqua	Russian Mission: 329 Range from 265 for Mountain Village to 634 for Holy Cross	Grayling: 246 pounds Range from 246 for Grayling to 445 in Shageluk
Subsistence Use Areas: Estimated square miles	No Quantitative Data Available	Nikolai: 757 square miles	Crooked Creek: 1,246 square miles	Kwethluk: 6,379 square miles	No Quantitative Data Available	No Quantitative Data Available	Emmonak: 6,111 square miles	Russian Mission: 987 square miles	Grayling: 1,164 square miles

Table 3.21-27: Comparison of Impacts by Alternative*

Summary Impacts by Component						
Impact-causing Project Component	**Alt. 2 – Proposed Action**	**Alt. 3A – LNG-Powered Haul trucks**	**Alt. 3B – Diesel Pipeline**	**Alt. 4 – BTC Port**	**Alt. 5A – Dry Stack Tailings**	**Alt. 6A – Dalzell Gorge Route**
Mine Site	Summary impact is minor, except moderate (beneficial) income effect. Intensity would be negligible in most instances, with low intensity effects on resources used by Crooked Creek residents during construction, and low after closure (but less than during construction). Duration of effects would be long-term during life of the mine. Effects would be generally local, except that perceived effect on waterfowl, effects of competition, and socio-cultural impacts would be regional in extent. Impacts from competition would affect scarce resources that are important in context. Socio-cultural impacts would affect subsistence communities that are unique in context, because protected by federal law and very rare in the U.S.	Same as Alt 2, because mine site foot print and level of activity remain the same.	Same as Alt 2, because the mine site footprint and level of activity would remain the same.	Same as Alt 2 because the alternative affects the mine access road, addressed under transportation facilities, while the mine site footprint and level of activity would remain the same.	Generally the same as Alt 2 because the alternative affects the tailings management at the mine site, while the mine site footprint and level of activity would remain the same.	Same as Alt 2 because the alternative affects the pipeline component, while the mine site footprint and level of activity would remain the same.
Transportation Facilities	Summary impact would be Minor, except Moderate for subsistence fishing in narrow reaches of the Kuskokwim River. Intensity would be generally low, except for medium effects from barging in narrow, shallow segments, and medium intensity impacts regarding displacement of access to fish camps near Angyaruaq (Jungjuk) port. Effects would be long-term in duration, and regional in extent, extending along the river transportation corridor. Resources affected would be important in context in regard to Chinook salmon, fish camps near Angyaruaq, and in-region competition. Context would be unique in the case of socio-cultural impacts to subsistence communities.	Barge frequency would be reduced by 32 percent due to reduction in diesel fuel barging. This would reduce impacts to fishing in narrow reaches of the river to low intensity. Summary effect would be the minor.	Barge frequency would be reduced by 47.5 percent with elimination of diesel fuel barging. This would partially reduce impacts to fish in narrow reaches of the river, so the intensity would be low. The expanded dock near Tyonek to receive diesel tankers would result in low intensity impacts to marine mammals, including beluga whales. The context would generally be important, considering Chinook salmon on the Kuskokwim River, while Cook Inlet beluga whales would be unique in context. Summary effect would be minor, including reduced impact to subsistence fishing in the affected segments of the Kuskokwim River. All other impact factors would be the same as Alt. 2.	Barging distance would be reduced by 39 percent, avoiding the generally more narrow reaches of the river above Birch Tree Crossing. A longer mine access road (46 miles, 250 percent longer) would increase displacement of habitat and casual, summertime, subsistence uses. Summary effect would be minor, including reduced barging distance and increased impacts from the longer mine access road. All other impact factors would be the same as Alt 2.	Same as Alt 2, as this alternative would not change the proposed transportation facilities component.	Same as Alt 2, as this alternative would not change the proposed transportation facilities component.

Table 3.21-27: Comparison of Impacts by Alternative*

Summary Impacts by Component						
Impact-causing Project Component	**Alt. 2 – Proposed Action**	**Alt. 3A – LNG-Powered Haul trucks**	**Alt. 3B – Diesel Pipeline**	**Alt. 4 – BTC Port**	**Alt. 5A – Dry Stack Tailings**	**Alt. 6A – Dalzell Gorge Route**
Pipeline	Summary impact would be minor, except moderate for increased competition near Farewell Airstrip. During construction, intensity of effects on subsistence hunting would be low, and low for subsistence fishing. During operations, the intensity of effects from the buried pipeline would be low (but less than during construction). However, increased activity at the Farewell Airstrip would constitute a moderate intensity increase in competition. Socio-cultural impacts from employment would be the same as for the mine-site. Duration would be long-term, and extent would be localized to segments of the pipeline. Harvest patterns affected would be generally common in context, except that increased competition in the Farewell Airstrip area would be important in context, based on the incremental increase to competition that already affects harvests by McGrath, Nikolai and Telida.	Same as Alt 2, as this alternative would not affect the pipeline component.	Same as Alt 2, except that retention of airstrips and gravel access roads for spill response capacity would result in moderate competition impacts to Beluga, McGrath, Nikolai, Takotna, Central Kuskokwim village and Crooked Creek.	Same as Alt 2, as this alternative would not change the proposed pipeline component.	Same as Alt 2, as this alternative would not affect the pipeline component.	The alternative route segment alternatives would affect other resources, but not subsistence practices. The Summary impact is the same as Alt 2.

Notes:
* The No Action Alternative would have no impacts on Subsistence resources.

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